AUTOMOTIVE and Aviation INDUSTRIES

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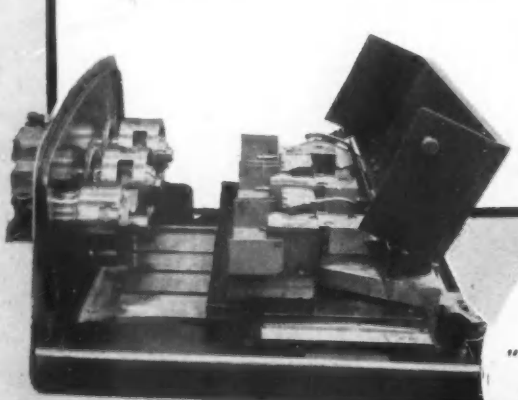
Get Maximum Cutting Efficiency
WITH VERSATILE HEALD BORE-MATICS

*V.F.3

FOR ALL JOBS—
ALL OPERATIONS—
ALL MATERIALS! Single-point tools are extensively employed for borizing operations on Heald Bore-Matics, cutting being done in a generated action. Broadnose tools and form tools are also used, often in conjunction with single-point tools, tool action being plunge cut. In addition to these tools, drills and reamers also can be effectively employed. Tools can be rotated in a fixed sweep by boring heads, can be rotated and simultaneously fed radially by rotating tool slides or can be rotated with cam control for contour operations; tools also can be mounted in tool blocks on the table, on cross-slides, or on angular slides for longitudinal tool travel, cross-feeding or angular movement. Cross-slides also provide means of indexing tools and tool retraction. Still another possibility are rotary tool blocks for spherical boring and turning. Any one of these tooling methods can be used separately or all of them can be combined for multiple operations on a single Bore-Matic. For more information, write...The Heald Machine Co., Worcester 6, Mass., U.S.A.



LOOK FOR
*V.F.
"VERSATILITY FACTOR"
in your Post War Tools

V F 1—Application
V F 2—Function
V F 3—Tooling
V F 4—Fixtures

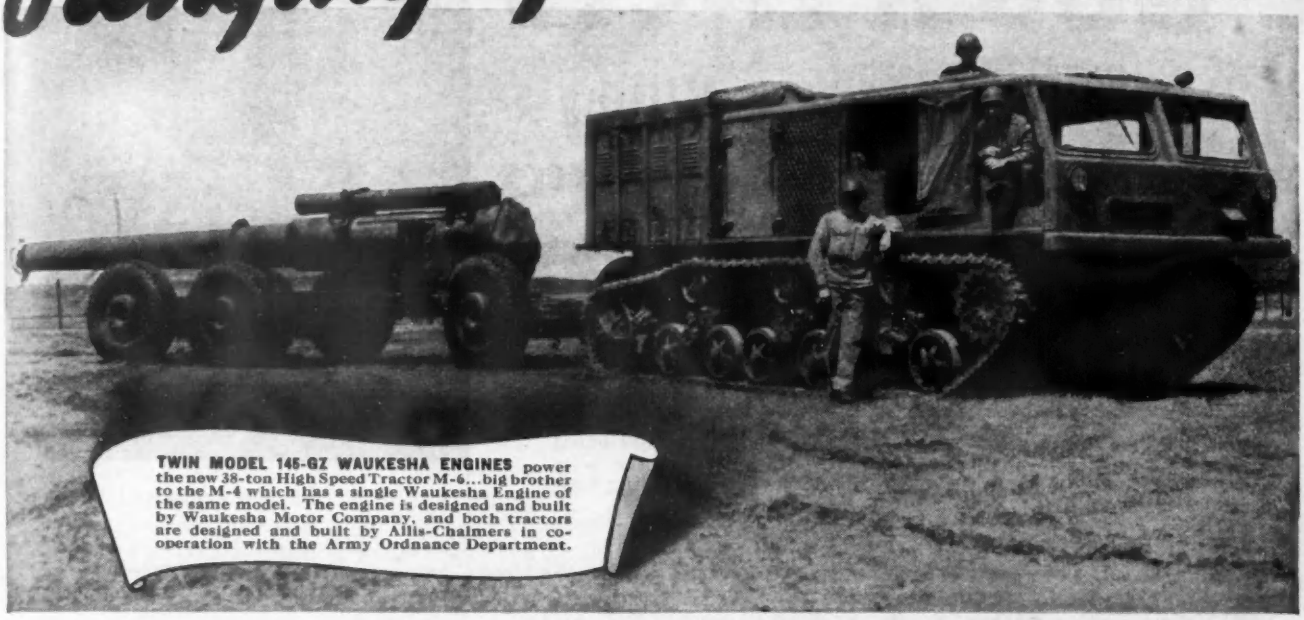
*THIS IS TOOLING VERSATILITY

Tooling of Heald Bore-Matics is specially designed to meet the specific requirements of each job. Versatile basic design makes possible almost limitless tooling combinations. Shown left is a Heald No. 47A Bore-Matic tooled up to drill, face, turn, chamfer and bore gear blanks.

HEALD *Bore-Matics*
THE MOST VERSATILE MACHINE TOOL

bringing up the BIG GUNS

OFFICIAL U.S. ARMY PHOTOGRAPH



TWIN MODEL 145-GZ WAUKESHA ENGINES power the new 38-ton High Speed Tractor M-6...big brother to the M-4 which has a single Waukesha Engine of the same model. The engine is designed and built by Waukesha Motor Company, and both tractors are designed and built by Allis-Chalmers in co-operation with the Army Ordnance Department.

...WITH WARTIME WAUKESHAS!

First things *first*... and first things *fast*. To our American artillerymen that means superiority of fire power—and moving up the big guns in a hurry!

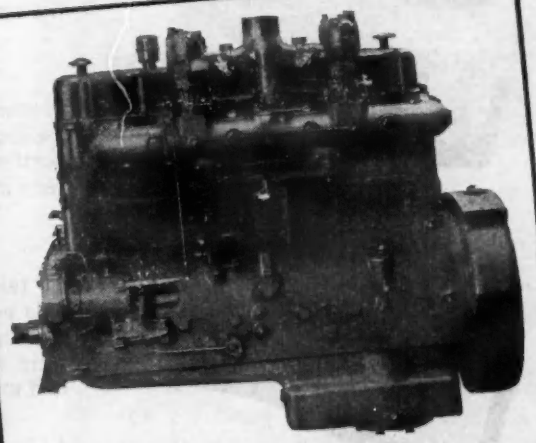
The giant artillery tractors start rolling. Powered by wartime Waukesha Engines... no road is too rough... no terrain too tough. Up come the 8-in. guns and the 240 mm. howitzers... into position... and it's all over but the shooting...

American fire power, amazingly accurate and deadly destructive, pounds the enemy defenses to pieces. It's all deeply depressing to enemy army morale.

No ordinary engine gives M-6 and M-4 Military Tractors their power to pull—their smoothness and swiftness. It's a wartime Waukesha—Model 145-GZ—a super power plant built by Waukesha to out-power and out-perform any similar engine of the same size ever produced!

Every Waukesha Engine will be a wartime engine, until V-Day. Then there'll be Waukesha peacetime engines for your special requirements. Write Waukesha engineers now about your future engine needs.

WAUKESHA MOTOR COMPANY, WAUKESHA, WIS.
NEW YORK • TULSA • LOS ANGELES



MODEL 145-GZ WAUKESHA ENGINE

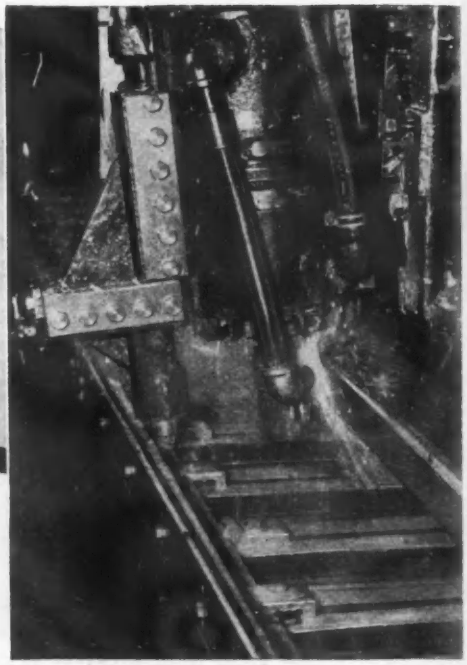
Six cylinders, 5⅜ in. bore x 6 in. stroke, 817 cu. in. displ. Burns gasoline... is designed to use modern aviation fuels... develops high output. And it's really rugged! Crankcase and cylinder block cast as a single unit. Crankshaft is drop-forged steel, heat treated. Wet sleeve cylinders easy to remove and replace. Positive pressure oiling with built-in oil cooler. Thermostatic by-pass system maintains efficient operating temperatures, and assures quick warm-up when starting.

MORE POWER FOR VICTORY

WAUKESHA ENGINES

QUICK FACTS

About High-Speed Milling For Future-Minded Manufacturers



New products and new materials require new methods and new machines. Lower costs and faster production will be yours by methods such as now made possible by Onsrud high speed milling machines. Redesigned types of this equipment as well as new types, now in various stages of development, will bring economies equal to the full potential of the metals themselves. As *you* plan *your* production for the future, remember these five facts regarding nonferrous metal milling.

FACT No. 1

The light metals—aluminum, magnesium and their alloys—have cutting characteristics that make high speed milling not only feasible but desirable.

FACT No. 2

These metals, with almost limitless applications, will likely attain the status of a plentiful, low-cost basic industrial material.

FACT No. 3

Production records and job experience—notably those obtained in making aircraft parts—prove that high speed milling lowers production costs *drastically*. There is no sacrifice of quality or accuracy in achieving production rates not possible with older methods.

FACT No. 4

To take full advantage of the possibilities of high speed milling, it is not enough to increase cutter RPM of conventional machines. The light metals have been called the "metals of motion." Equipment for their machining must possess high speed feed traverse and unusual flexibility.

FACT No. 5

As pioneer builders of high speed, high production machines, Onsrud Machine Works, Inc., has the necessary background of experience and the intimate knowledge of the subject to build such machines. Look to Onsrud in the future for developments in high speed milling equipment for the light metals and their alloys.

ONSRUD MACHINE WORKS, INC.

3925 Palmer Street, Chicago 47, Illinois

Onsrud

Manufacturers of Routers, Shapers, Automatic Contour Milling Machines and Related Portable Tools for Aircraft Production

MACHINE TOOLS AND METHODS FOR TOMORROW'S PRODUCTION

AUTOMOTIVE and Aviation INDUSTRIES

Published Semi-Monthly

Volume 91 | August 15, 1944 | Number 4

CONTENTS

Automotive Division
Jos. S. HILDRETH, President and Manager
JULIAN CHASE, Vice Pres. — G. C. BUZBY, Vice Pres.

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Capsules OF LIFE OR DEATH!

Valves—that's what these are—and their innocent appearance serves only to conceal their importance. For these valves are to modern warfare what the famous "horseshoe nail" (for the want of which the battle was lost!) stood for in the simpler fighting days of two hundred years ago. Designed for the control of oil, gas and other fluids, they are in active wartime service in aircraft of all types on every fighting front.

The four Weatherhead plants have long been fully engaged in making vital parts for the nation's war machines at the rate of more than a million a day—and are prepared to make the same gigantic contribution to the peacetime needs of the nation!

Look Ahead with

Weatherhead

THE WEATHERHEAD COMPANY, CLEVELAND, OHIO

Manufacturers of vital parts for the automotive, aviation, refrigeration and other key industries.

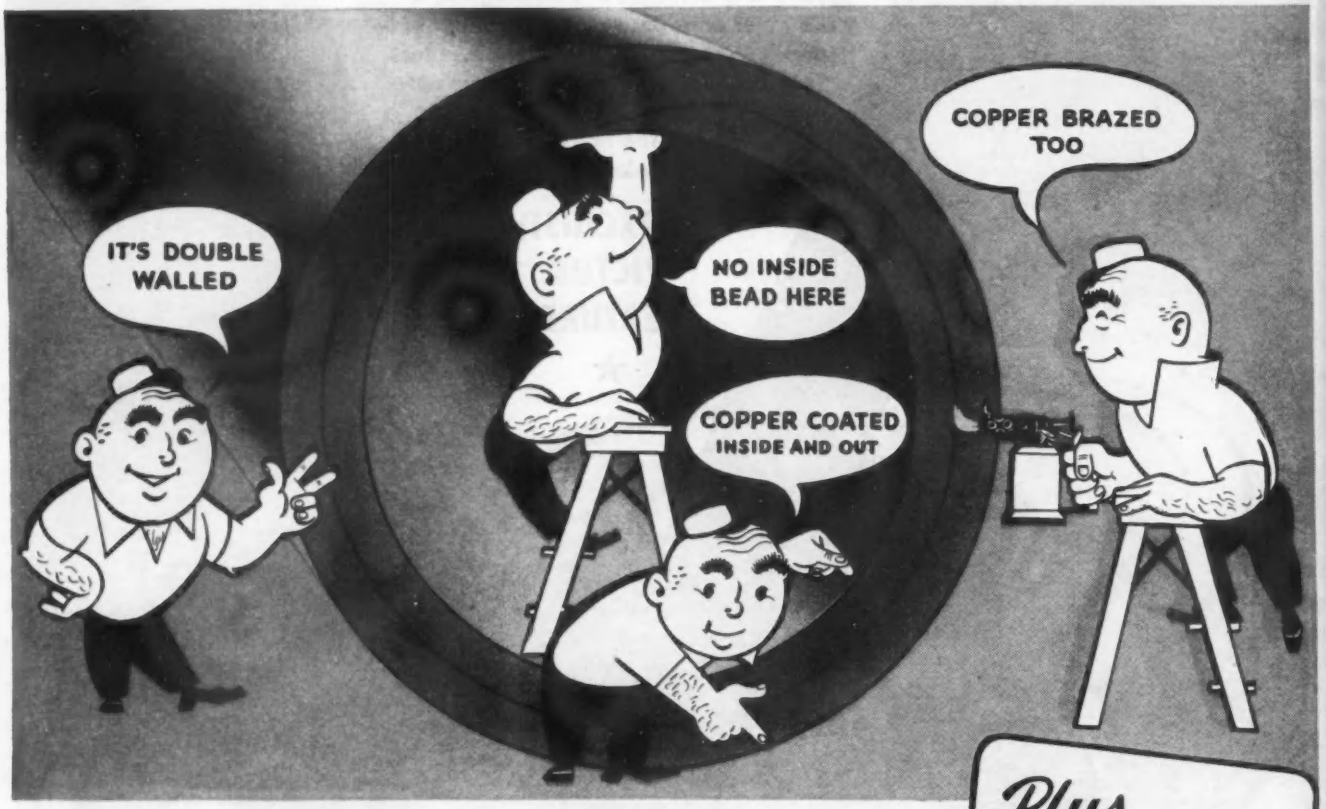
Plants: Cleveland, Columbia City, Ind., Los Angeles
Canada—St. Thomas, Ontario

FREE: *Write on company letterhead for "Seeds of Industry"—a history of The Weatherhead Company, its many facilities and diversified products.*


A LEAK-PROOF PRESS FIT
Victor Oil Seals are lathe turned or centerless ground to a tolerance of plus or minus .002". The outer edge is maintained parallel to and concentric with the shaft. Close control of production insures an outside diameter slightly larger than the bore of the housing, making certain a leak-proof press fit.
AN EXCLUSIVE VICTOR FEATURE
★
PATENTED
VICTOR

Good On All Four Counts

BUNDYWELD STEEL TUBING



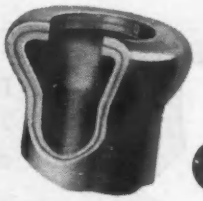
Unique, Exclusive Bundyweld Provides Superior Construction

Depend on Bundyweld, for superior strength and resistance to vibration fatigue. This solid double-walled steel tubing, laterally rolled from a single copper-coated S.A.E. 1010 steel strip and completely copper brazed throughout the entire 360° of wall contact, assures the utmost in ductility, cleanliness and uniform wall thickness.

Bundyweld is furnished hard or annealed in a wide range of standard diameters and gauges up to 5/8" O. D. Special sizes, cold drawn as desired. Also furnished in Monel. Write us direct for further data in connection with your war or peacetime tubing problems. Bundy Engineers will be glad to assist you. Bundy Tubing Company, Detroit 13.

Plus

FAMOUS BUNDY DOUBLE FLARE



1

2

- Leak-proof, pressure-proof joints
- Safely permits over-torqueing

"FAMOUS LIFE LINES" FOR WAR AND PEACE

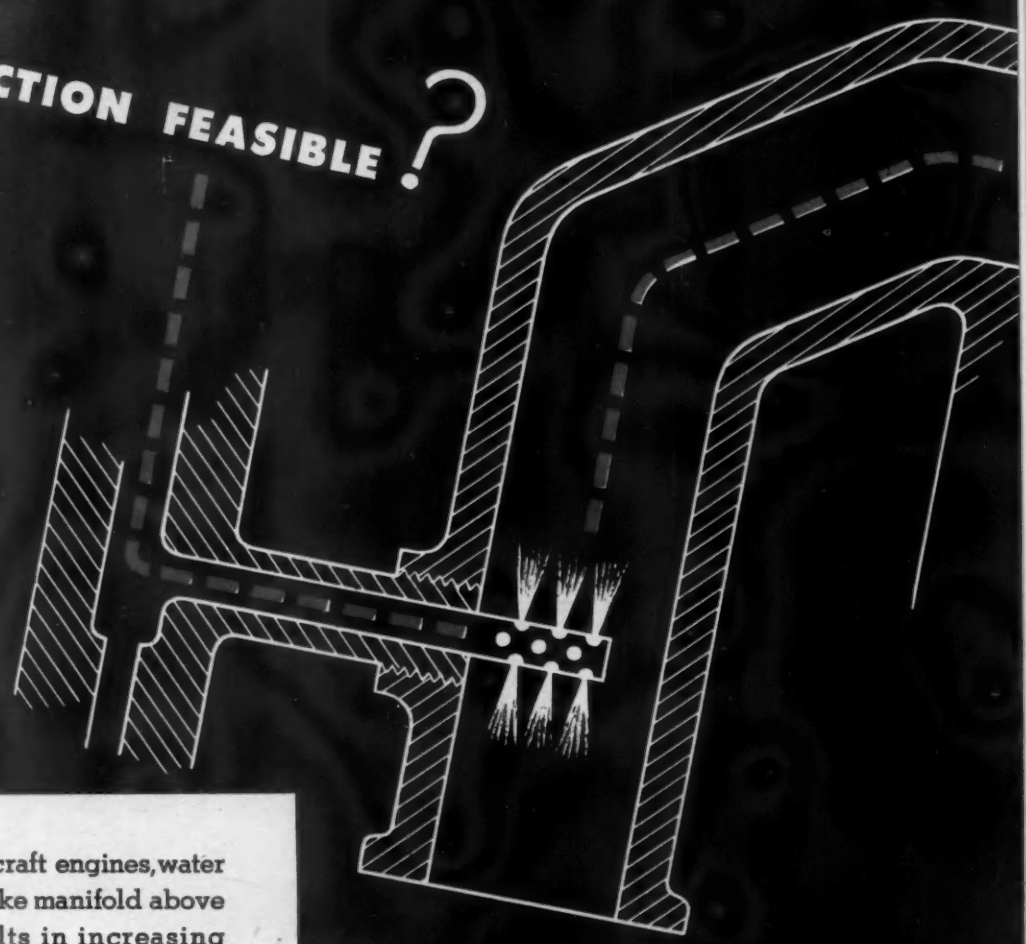
BUNDY TUBING

ENGINEERED TO YOUR EXPECTATIONS

BUNDY TUBING DISTRIBUTORS AND REPRESENTATIVES:

Pacific Metals Company, Ltd. 3100 19th Street San Francisco 10, California	Standard Tube Sales Corp. 1 Admiral Avenue Mas[illegible]th, New York City, N. Y.	Lapham-Hickey Company 3333 W. 47th Place Chicago 32, Illinois	Rutan & Company 112 South 16th Street Philadelphia 2, Pennsylvania	Eagle Metals Company 3628 East Marginal Way Seattle 4, Washington

IS WATER INJECTION FEASIBLE?



In certain military aircraft engines, water injection into the intake manifold above the carburetor results in increasing power as much as 40%. Cylinder and ring wear, according to reports, are reduced and carbon formations minimized.

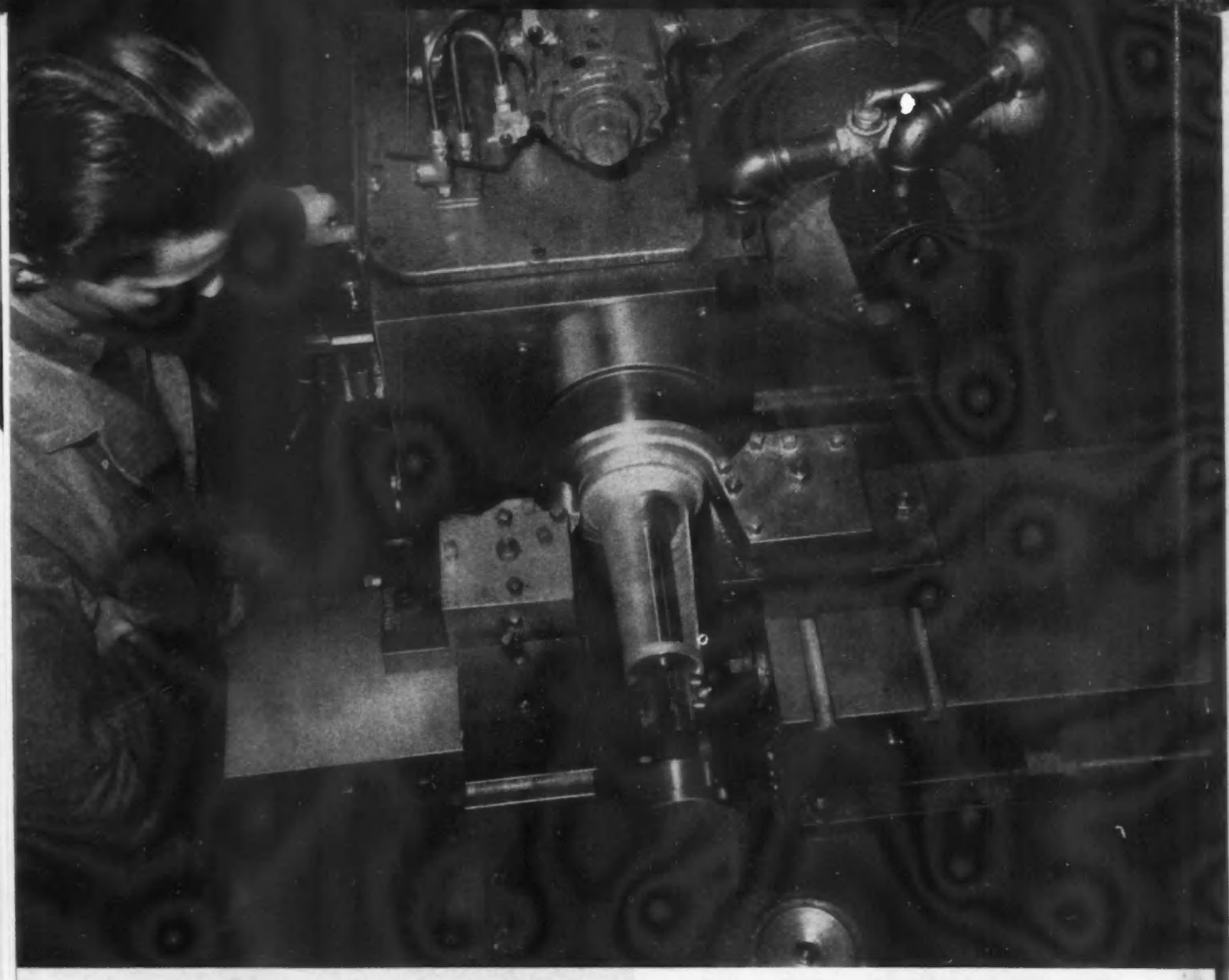
Apparently the improvement comes from reduced cylinder head temperatures and a slowing down of the rate of fuel burning with consequently more complete combustion without detonation. Refinements of this practice in the aircraft field might make water injection feasible for automotive engines.

To the builders of the "engine-of-the-future" — whatever its features of advanced design may be — Muskegon engineers and metallurgists offer their vast piston ring building experience.

Buy More War Bonds!

MUSKEGON
Piston Rings

MUSKEGON PISTON RING CO.
MUSKEGON, MICHIGAN
PLANTS AT MUSKEGON AND SPARTA



DOUBLE DUTY

WITH THE GISHOLT HYDRAULIC AUTOMATIC LATHE

ACTUALLY "double duty" is ultra-conservative for the production ability of this automatic lathe. For it can out-produce two, three, or even four manually operated machines wherever parts are to be turned out in large quantities.

What's more, its operation is so simple that one man, or woman, can tend two or three machines at a time. With but one small lever to control a whole cycle of operations, the training problem is practically eliminated. It's designed to handle a wide variety of between-centers and chucking work with high speed multiple cutting and extreme accuracy. If you can use this kind of production—to save man-power and cut costs—now and in the post-war period—ask for facts about the Gisholt Hydraulic Automatic Lathe.

GISHOLT MACHINE COMPANY

1205 East Washington Ave. • Madison 3, Wis.

Look Ahead . . . Keep Ahead . . . With Gisholt Improvements in Metal Turning

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES • SPECIAL MACHINES

A Single Cardox System Provides Engineered Extinguishing Coverage for One or a Number of Hazards . . . Large and Small

The swift efficiency of carbon dioxide for fire extinguishment is thoroughly recognized. But, where a few pounds, properly applied, will stop one fire, another may call for tons . . . for example, to provide total flooding of large plant production areas, or for severe outdoor hazards.

With the Cardox method of control and engineered application, Cardox CO_2 —supplied instantly *in pounds or tons* —gives new protection scope to this non-damaging, non-contaminating medium for fire extinguishing.

Enhanced CO_2 Performance

A Cardox System—engineered for the specific hazards it covers—extinguishes fires by a timed *mass* discharge of Cardox CO_2—stored at 0°F. in a mechanically refrigerated Storage Unit.

Enhanced extinguishing performance is possible because, as controlled and applied—*in pounds or tons*—in Cardox Systems: (1) Cardox CO_2 has uniform extinguishing characteristics regardless of plant or atmospheric temperatures; (2) Applications can be engineered in accordance with the requirements of each specific hazard covered; (3) High CO_2 snow yield provides increased cooling effect (carbon dioxide released at 0°F. yields 45% CO_2 snow); (4) Effective projection through relatively great distance is achieved—even outdoors.

Tough Hazards Have "Engineered" Cardox Systems

It is no coincidence that frequently when hazards are toughest to handle . . . where fire or damage by the extinguishing medium would disrupt carefully planned war goods production schedules . . . engineered protection is provided by Cardox Fire Extinguishing Systems.

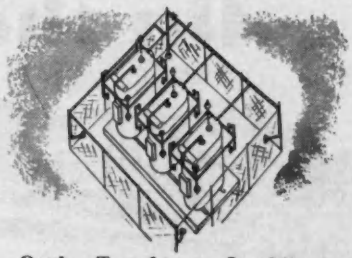
If you would like more information for use in solving current war plant fire protection problems . . . or in formulating fire protection plans that will prevent dangerous delays in getting post-war production in high gear . . . write on company letterhead for Bulletin 484.

CARDOX CORPORATION
BELL BUILDING • CHICAGO 1, ILLINOIS
District Offices in
New York, Boston, Washington, Detroit, Cleveland, Atlanta, Pittsburgh, San Francisco, Los Angeles, Seattle

CARDOX
CO_2 FIRE EXTINGUISHING SYSTEMS

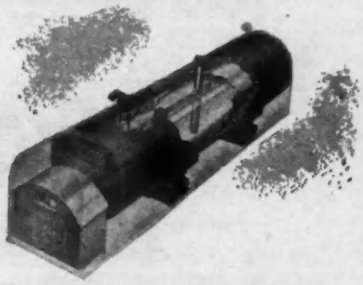
FOR EXAMPLE

These sketches illustrate simply the broad scope of protection that can be provided by a *single* Cardox System. The range of efficient applications between these extremes is practically unlimited.



Outdoor Transformers. Local direct application at very high rate builds area flooding effect outdoors. For hazards such as this a Cardox System stands ready at the first flash of fire with *tons* of Cardox CO_2, if needed.

Cardox Hose Reel provides effective protection for numerous hazards calling for a *few pounds* of Cardox CO_2—or a *few hundred*.

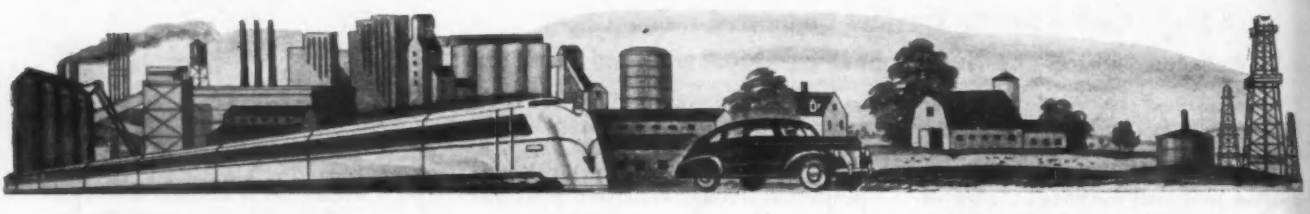


Cardox CO_2 is supplied instantly in pounds or tons from a single Storage Unit containing 500 pounds to 125 tons at controlled low temperature of 0°F. and 300 p.s.i.

On the Far-Flung Battle Fronts

of the world, millions of Hyatt Roller Bearings are doing their jobs consistently well...carrying the bearing loads of tanks, planes, guns, ships, trucks, and tractor bulldozers.

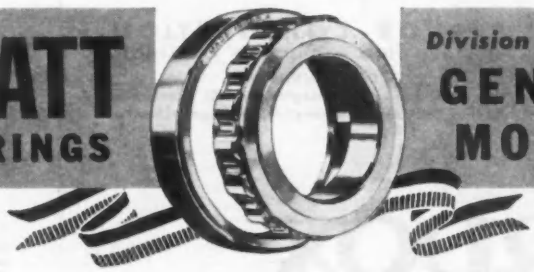
On the Home Front, too,



Hyatt continues to serve America...on railway and highway and farm, in mill and factory... wherever wheels and shafts turn for victory!

Hyatt Roller Bearings are built to last...with minimum care. But don't forget to give them the proper attention all precious anti-friction bearings deserve today.

HYATT BEARINGS



Division of GENERAL MOTORS

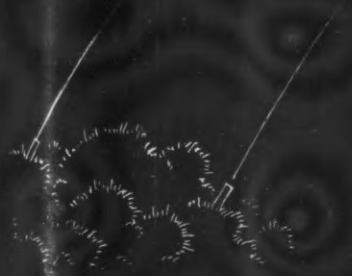
HYATT BEARINGS DIVISION - GENERAL MOTORS CORPORATION · HARRISON, NEW JERSEY

WAR PLANES USING AMERICAN HAMMERED PISTON RINGS

A-20 Havoc
A-22 Maryland
A-24 Dauntless
A-25 Shrike
A-29 Hudson
A-30 Baltimore
A-31 Vengeance
A-34 Buccaneer
A-36 Invader
B-17 Flying Fortress
B-18 Bolo
B-23 Dragon
B-24 Liberator
B-25 Mitchell
B-26 Marauder
B-29 Superfortress
B-34 Ventura
C-43 Traveler
C-45A Voyager
C-46 Commando
C-47 Skytrain
C-53 Skytrooper
C-54 Skymaster
C-56 Lodestar
C-61 Forwarder
C-69 Constellation
C-76 Caravan
C-87 Liberator Express
J-4-F Widgeon
L-1 Vigilant
L-2 Hedgehopper
L-3 Grasshopper
L-4 Grasshopper
L-5 Sentinel
O-52 Owl
P-40F War Hawk
P-43 Lancer
P-47 Thunderbolt
P-51B Mustang
P-61 Black Widow
P-66 Vanguard
AT-6 Texan
AT-7 Navigator
AT-8 Bobcat
AT-9 Jeep
AT-10 Wichita
AT-11 Kansas
AT-13 Yankee Doodle
AT-14 Yankee Doodle
AT-15 Crewmaker
AT-17 Bobcat
AT-19 Reliant
BT-13 Valiant
BT-15 Valiant
PT-13 Caydet
PT-17 Caydet
PT-19 Cornell
PT-22 Recruit
PT-26 Cornell
F2A Buffalo
F4F Wildcat
F4U Corsair
F6F Hellcat
N2T Tutor
OS2U Kingfisher
PBM Mariner
PBY Catalina
PB2Y Coronado
SB2A Bermuda
SB2C Helldiver
SB2U Vindicator
SBD-3 Dauntless
SO3C Seagull
SNC Falcon
SNJ Texan
TBD Devastator
TBF Avenger
JRM-1 Mars
YO-51 Dragonfly
Sikorsky Helicopter

PROVING GROUNDS

In 80 types of Allied war planes—from the smallest like this L-4 Grasshopper to the B-29 Superfortress . . . in destroyers, escort and landing craft, submarines . . . in tanks, trucks, jeeps, bulldozers, American Hammered Piston Rings prove their absolute correctness for every purpose. Koppers Company, American Hammered Piston Ring Division, Baltimore, Maryland.



L-4 GRASSHOPPER SPOTTING ARTILLERY FIRE

American Hammered Piston Rings

A KOPPERS PRODUCT

The only Army-Navy "E" awarded for Piston Ring Production

One of the many types of Sylphon Thermostats supplied to the automotive manufacturer. Extensive engineering facilities available for special designing.

THEY'LL LOOK AT THE WORKS

ONE of these days—soon we hope—drafting rooms will be working overtime rushing "general arrangements" for new civilian automobiles. Body designers and production men probably will be having their usual arguments—but one thing is certain . . . post-war buyers will look *at the works.*

Never before have we, as a people, become so conscious of sound engineering practice. Returning service men will remember the refinements that kept their automotive equipment running under conditions they never thought possible . . . home-front soldiers will recall the troubles they had when their cars were made to run long after they normally would have been traded in.

One of the things that helps to *keep* cars running is the automotive thermostat . . . pioneered by The Fulton Sylphon Co. and improved models will be used to assure the same dependable service in post-war cars. Why not start thinking now about these universally accepted thermostats for your 194X design? Write for Bulletin OB-824.

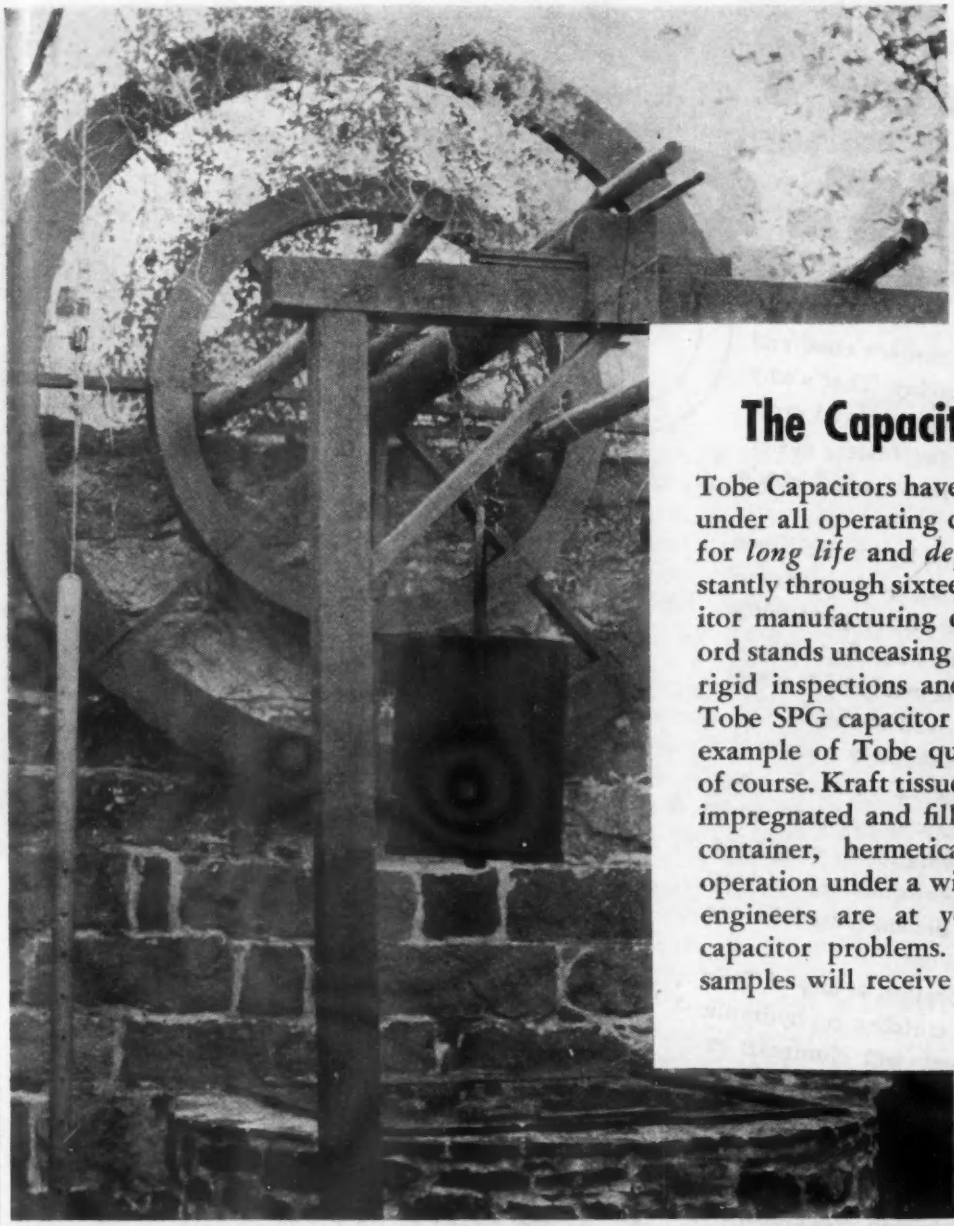
TEMPERATURE CONTROLS . . .

FULTON SYLPHON

BELLOWS . . . BELLOWS ASSEMBLIES SINCE 1904

THE FULTON SYLPHON CO., KNOXVILLE 4, TENNESSEE

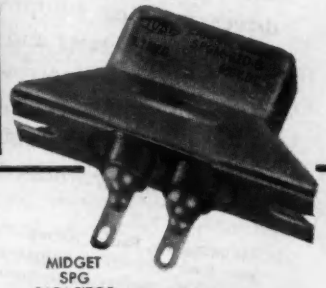
Canadian Representatives, Darling Bros., Montreal



Old Mining Shaft at Newgate Prison in Granby, Conn. The Granby Mines, perhaps the most historic in America, are over 225 years old.

The Capacity to "TAKE IT!"

Tobe Capacitors have proved they can "take it"—under all operating conditions. Their reputation for *long life* and *dependability* has grown constantly through sixteen years of specialized capacitor manufacturing experience. Behind this record stands unceasing Tobe research, frequent and rigid inspections and *conservative ratings*. The Tobe SPG capacitor illustrated below is a good example of Tobe quality. Top grade materials, of course. Kraft tissue, aluminum foil. Mineral oil impregnated and filled, in a streamlined drawn container, hermetically sealed. Designed for operation under a wide temperature range. Tobe engineers are at your ready disposal in all capacitor problems. Inquiries and requests for samples will receive prompt attention.



MIDGET SPG CAPACITOR

SPG CAPACITOR

SPECIFICATIONS

SPG-CAPACITORS

TYPE	SPG*
RATINGS	.05 to 2.0 mfd. 600 V. D. C. .05 mfd. to 1.0 mfd. 1,000 V. D. C.
STANDARD CAPACITANCE TOLERANCE	20%**
TEST VOLTAGE	Twice D. C. rating
GROUND TEST	2,500 Volts D. C.
OPERATING TEMPERATURE	-55° F to 185° F
SHUNT RESISTANCE	.05 to 0.1 mfd. 20,000 megohms .25 to 0.5 mfd. 12,000 megohms 1.0 mfd. 10,000 megohms 2.0 mfd. 5,000 megohms
POWER FACTOR	1,000 cycles—.002 to .005
CONTAINER SIZE	Width ⅝", length 1 5/16", height 2¼"
MOUNTING HOLE CENTERS	1½"

MIDGET SPG-CAPACITORS

TYPE	SPGM*
RATINGS	.05, .1 and 2 x .05 600 V. D. C. .05 and .1 1,000 V. D. C.
STANDARD CAPACITANCE TOLERANCE	20%**
GROUND TEST	2,500 V. D. C.
OPERATING TEMPERATURES	-55° F to 185° F
SHUNT RESISTANCE	20,000 megohms
POWER FACTOR	At 1,000 cycles—.0075
CONTAINER SIZE	Width ⅝", length 1 5/16", height 1 11/64"
MOUNTING HOLE CENTERS	1½"

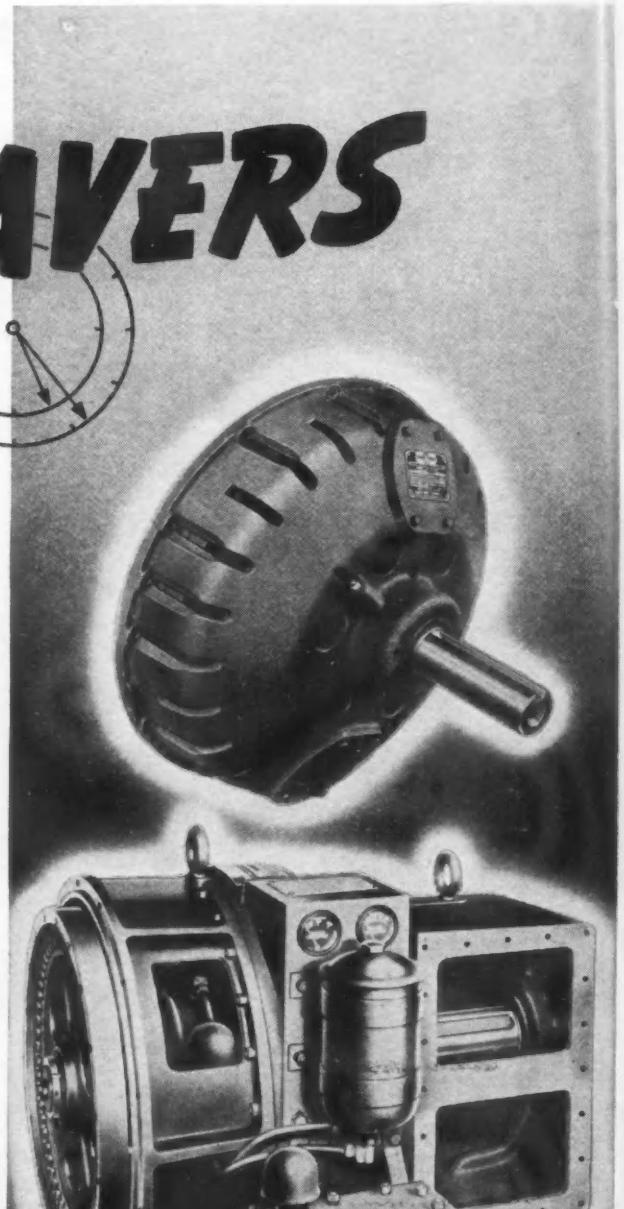
*Data sheets showing complete code number for units having a specific capacitance value and voltage rating available on request. **Other tolerances available.

Illustrations show capacitors with terminals on bottom.
Capacitors also available with terminals on top.

TOBE DEUTSCHMANN CORP. TOBE CANTON · MASSACHUSETTS

A small part in victory today... **A BIG PART IN INDUSTRY TOMORROW**

Tomorrow's TIME-SAVERS



Any time saved must be tomorrow's time and that saving must be planned today. That's why tomorrow's time savers . . . the improved products that will do specific jobs faster, easier, better and cheaper . . . are now on industry's drawing boards.

Since Twin Disc clutches and hydraulic drives will play an essential role in the performance of tomorrow's equipment, it is our responsibility to work one step ahead of the manufacturer . . . to anticipate his needs and be ready with power links already tested and proved in the field.

The Twin Disc Clutch Company has recognized this responsibility for 26 years . . . has made it a basic part of company policy to work in advance of industry's demands by supplying products whose efficient performance and long wear-life have been fully demonstrated *before* they are placed in general use.

That's why the incorporation of any of Twin Disc's standard friction clutches or hydraulic drives in *your* equipment will eliminate extensive clutch tests and reduce post-sale clutch service. Save tomorrow's "proving time" by specifying Twin Disc clutches and hydraulic drives. TWIN DISC CLUTCH COMPANY, Racine, Wisconsin, (Hydraulic Division, Rockford, Ill.).

ILLUSTRATED, RIGHT, ABOVE: *Twin Disc Hydraulic Power Take-offs have already demonstrated their efficient performance in a wide variety of industrial applications.*

ILLUSTRATED, RIGHT: *Meeting the test and proving itself on the battlefronts—the Twin Disc Torque Converter (Lysholm-Smith type) will come out of the war a veteran—ready for your heavy-duty, peace-time applications. For advance specifications ask for Bulletin 135-A.*

SPECIALISTS IN INDUSTRIAL CLUTCHES SINCE 1918

IN THIS ISSUE . . .

AUTOMOTIVE and AVIATION INDUSTRIES

Volume 91 August 15, 1944 Number 4

AUTOMOTIVE INDUSTRIES

Reg. U. S. Pat. Off.

More On Leadership

By Julian Chase

A FEW issues back there appeared in this column some comments on leadership in a democratic form of government. The point was made that, for the greatest good of all its citizens and for the continuance of such a government over even a moderately long period, it is essential that its leadership be informed, intelligent and intellectually honest.

If we agree that that statement has in it at least a modicum of truth, we can look with interest and undoubtedly will look with some degree of astonishment and misgiving at certain pronouncements in the recently adopted platform of the political party in power, and at statements made by the key-noter at that party's latest national convention.

The first two paragraphs of Section III of that platform read as follows:

"Before war came the Democratic administration awakened the nation, *in time*, to the dangers that threatened its very existence.

"It succeeded in building, *in time*, the best-trained and equipped Army in the world, the most powerful Navy in the world, the greatest air force in the world and the largest merchant marine in the world."

The italics are ours but italics are not necessary, in view of the punctuation, the phraseology and the repetition, to make perfectly clear the meaning it was intended to convey. In time? In time for what? In time to prevent the disaster of Pearl Harbor? In time to save the Philippines, Guam and Wake? In time to prevent the sinking of scores of our tankers off the Atlantic coast and thus forestall the serious crippling of our highway transportation system? In time to save what was then our only source of rubber, our principal source of tin and other essential materials? In time for what? In time for the war or for the election?

And was it the administration alone that built our Army and our Navy and made them the best equipped fighting forces in the world? Didn't industry have anything to do with it? Didn't Republicans as well as Democrats contribute equally, not as members of this or that political party, but as patriotic Americans who wholeheartedly and without partisanship devoted all of their energies and their ingenuity to the task of pulling us out of a deep and treacherous hole into which circumstances, largely divertable but

(*Turn to page* 96, *please*)

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AUTOMOTIVE and AVIATION INDUSTRIES

Published on the 1st and 15th of the month

Aug. 15, 1944
Vol. 91, No. 4

SWPA Report Favors Industry Channels for

Disposal of Surplus Aircraft

IN ITS report submitted recently to the Surplus War Property Administration concerning the disposal of surplus aircraft by the United States Government, the Surplus Aircraft Advisory Subcommittee advises that surplus warplanes should not be maintained as a civilian military reserve, because as such they would become only meaningless quantities of obsolete planes that would add nothing to America's military strength and instead would serve to create an impression of national security that would be false. Neither of the two extremes—dumping surplus planes on the market at whatever prices they will bring nor the scrapping of all surplus aircraft—is advocated, but rather the use of industry channels in a normal way as offering the greatest benefit to the country.

The committee has been studying the problem since March 15 of this year, during which time conferences were held with representatives of the aircraft manufacturing industry, air transport companies, airline pilots, labor organizations, and trade associations having aviation interests. It is pointed out that the report represents unanimity of opinion of all committee members comprising L. Welch Pogue, chairman, who also is head of the Civil Aeronautics Board; Stokeley W. Morgan, chief, Aviation Division, Dept. of State; Col. F. Trubee Davison, chief, Special Projects Office Headquarters, Army Air Forces; Rear Admiral Lawrence B. Richardson, assistant chief, Navy Bureau of Aeronautics; William A. M. Burden, Assistant Secretary of Commerce; Walter E. Joyce, vice-president, Defense Plant Corp.; Paul T. David, chief fiscal analyst, Bureau of the Budget; and William Pawley, consultant, Surplus Aircraft Disposal, Foreign Economic Administration.

The report urges the necessity for the close coordination of disposal policies in respect of national and international operations, pointing out that there are many interwoven factors requiring the operating personnel to be sensitive to changing world conditions. In this report, the committee recommends that:

(1) The Director of the Aviation Division, under the direction of the Surplus War Property Administrator, should be empowered to make divisions of quantities of surplus aircraft for domestic and foreign disposal, and to make allocations of transport types of aircraft to individual applicants; also, that a working committee be established to act upon the conclusions of the Aviation Division. This committee is to include representatives of the Department of State, War Department, Navy Department, Department of Commerce, Civil Aeronautics Board, Reconstruction Finance Corporation, and the Foreign Economic Administration, and of such other Federal agencies as the Surplus War Property Administrator may direct.

(2) There should be established an Aircraft Advisory Board which, whenever requested by the Surplus War Property Administrator, will serve in an advisory capacity to the Administrator on broad policy matters; such Board to consist of one member from each of the Federal agencies mentioned in the previous recommendation.

After dealing with over-all policy in Part I, the report sets forth in Part II specific recommendations in some detail. The different types of surplus aircraft are divided into five classes: (A) Tactical aircraft, meaning planes useful only for military purposes; (B) Transport aircraft, meaning larger planes primarily useful for scheduled transport operations; (C) Personal aircraft, smaller planes with non-military uses (adaptable to personal flying, fixed-base operations, training, and a wide variety of miscellaneous uses by Governmental departments and private corporations; (D) Aircraft equipment and components, useful for both military and non-military purposes; (E) Unabsorbed surplus, meaning all other planes and components (including equipment in unsound condition) not useful for further military or commercial purposes.

In discussing the disposal of tactical aircraft, the committee emphasizes its recognition that the only significant permissible market will be the governments of friendly foreign nations and recommends that no surplus tactical aircraft, designated as Class A, be disposed of save with the specific approval of

(*Turn to page* 98, *please*)

Method of Maintaining

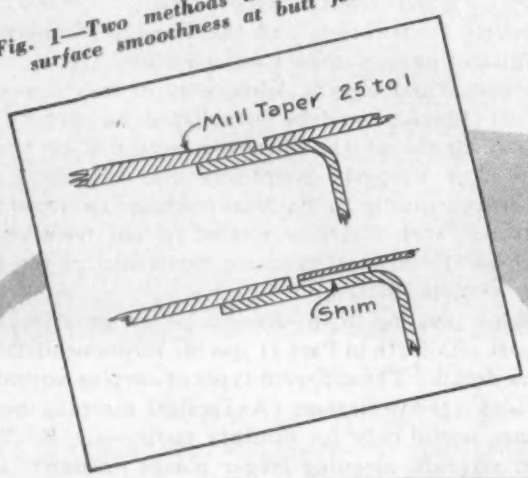
Smoothness *of Airplane*

INCREASING demands for a higher type of aircraft performance have resulted in considerable aerodynamic research into the effect of the surface smoothness of aircraft structures on this performance. This surface smoothness should not be confused with so-called laminar flow characteristics, which relate to another subject entirely. Surface smoothness discussed here alludes to the elimination of surface bumps, dents, and other depressions and projections which interfere with the smooth flow of an air stream past or around the surfaces concerned.

Zone 1 surfaces are those on which smoothness is most critical to performance. On such surfaces fairness is of supreme importance, even more so than strict adherence to contour. In general, the slope of the surface should vary smoothly along the direction of airflow. A simple and reliable fairness test is to rock or roll a straight edge around the surface in the direction of the airflow. If the straight edge will roll smoothly without bumping, the surface is satisfactory. A bump, however slight, betrays the presence of a fairness-destroying hollow. The structure must be stiff enough to avoid development of these hollows under any normal flight load.

The conditions set forth for Zone 1 surfaces present a definite challenge to the ingenuity of designers, tooling and manufacturing personnel, for it is generally agreed that such smoothness cannot be obtained in most cases with existing design, techniques and prac-

Fig. 1—Two methods used to produce surface smoothness at butt joints.



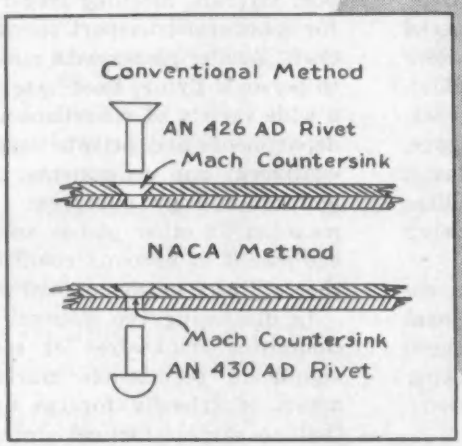
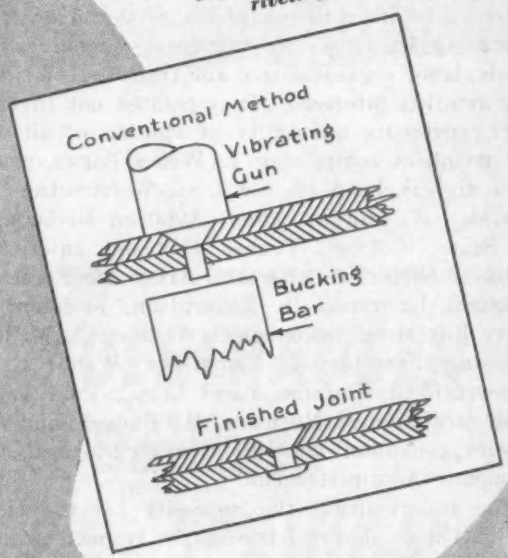


Fig. 2—Comparison of conventional and NACA riveting methods.

Fig. 3—Conventional hand riveting method.



By A. H. Petersen
Production Design Department Engineer,
Lockheed Aircraft Corp.

External Surfaces

tices. Following are notes on design, tooling, riveting, spotwelding and the use of organic finishes contributing to the production of such surfaces.

Design

A. Skin gages should not be less than 0.040 in., as these would require dimpling and are inherently "canned" as received in the sheet. Dimpled skins cannot be riveted by the NACA or regular method and produce the smoothness desired. The only exception to this practice might be for spotwelded assemblies, where the gage can be a minimum of 0.032 in. To avoid distortion, skins should be countersunk for screws wherever possible rather than dimpled.

B. Stamped inner frames may provide a satisfactory substructure, but a considerable amount of research along this line is yet to be made.

C. Shrink flanges formed on the hydro press cannot be expected to mate with or maintain a true, smooth contour without some handworking.

D. Nose ribs should be cut away at the leading edge to insure forming to fit the contour exactly.

E. Parts that can be formed by stretching will meet Zone 1 smoothness requirements if sub-structures are stiff enough.

F. All skin joints should be of the butt type. Where gages change at these joints, whether chordwise or spanwise, the difference should be made up by adding shims under the thinner skin or by milling off the thicker skin at a taper of approximately 25 to 1, as shown in Fig. 1.

G. Fuselage stringers should have a curved skin attaching flange to prevent flat areas at the rivet lines.

Tooling

The usual procedure of hydro press forming of flat-flanged parts, wherein parts are formed from 24 SO, hand-worked to remove wrinkles and to set joggles, heat treated and again hand-worked to remove heat-treat distortion, will not produce parts which will give an assembly the required surface smoothness. Where

(*Turn to page* 104, *please*)

Fig. 4—NACA hand riveting method.

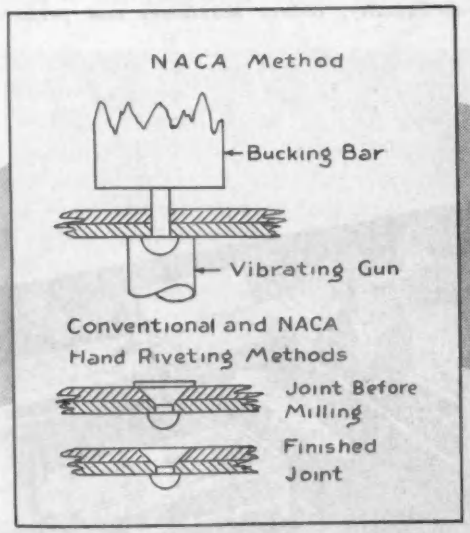
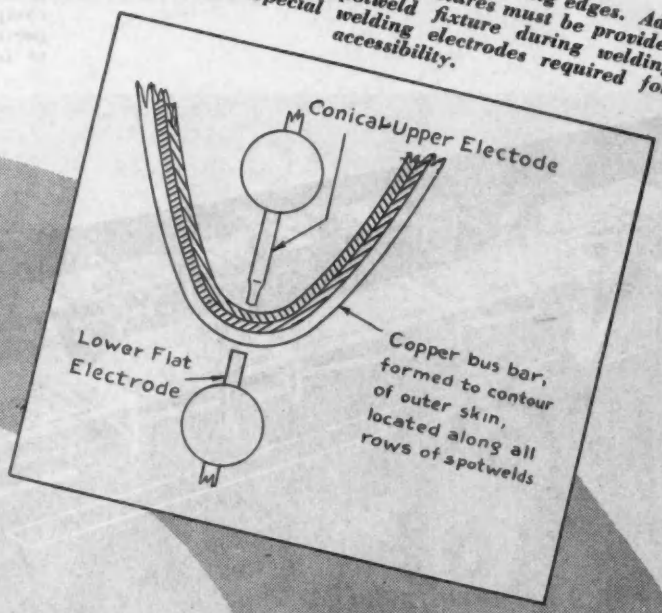


Fig. 5—Tooling for spot welding leading edges. Adequate overhead positioning fixtures must be provided to support heavy spotweld fixture during welding operation. Special welding electrodes required for accessibility.



Production Improvements *that* Bomber Output *at*

THE Kansas City Division of North American Aviation, Inc., fabricates the B-25 Mitchell. It has become the largest medium bomber producing plant in the world within little more than two years. The constant aim of J. H. (Dutch) Kindelberger, company president, at the Kansas and Dallas divisions as well as at the parent Inglewood plant, has been to produce more units per square foot of factory space per manhour.

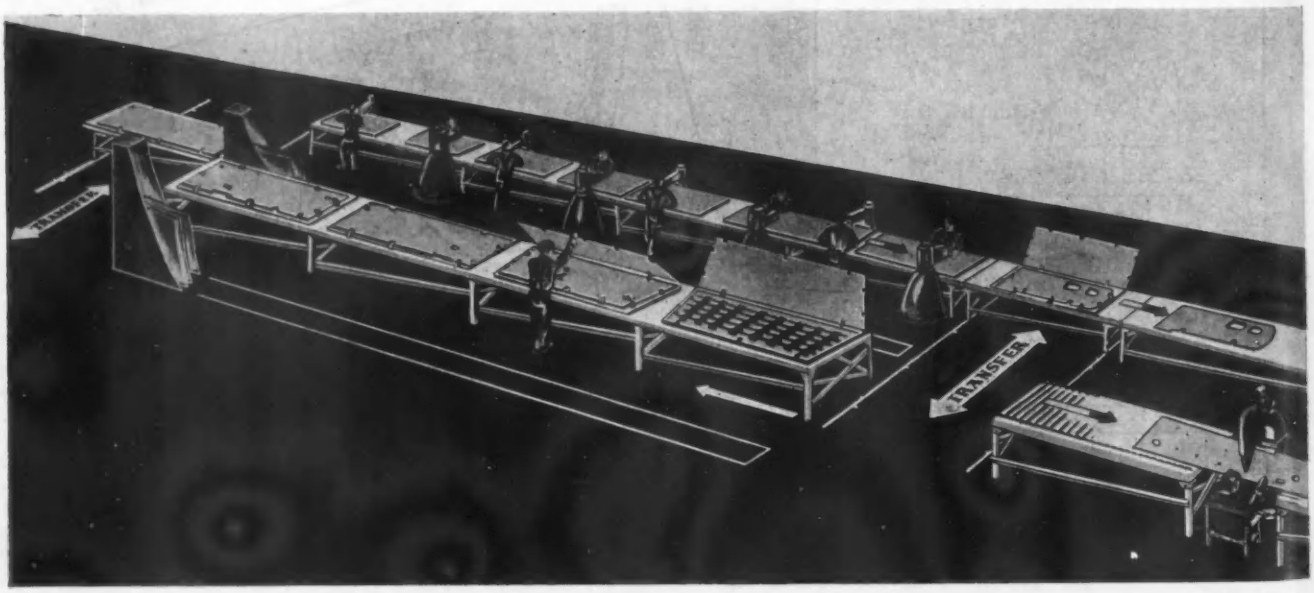
The most vivid constant at the Kansas plant is change; the enterprise is entirely geared to immediate change. Methods enginering is in constant flux. Time and motion savings, cost reductions, increased production speed and flow have resulted, with phenomenal improvements in procedure. Within the year, total manhours per B-25 airframe have been reduced 40 per cent. Other progress is developing under the able management of Harold R. Raynor and Dutch Kindelberger. In this article will be described some of the methods and practices that have contributed to the production accomplishments.

North American has its Methods Department organized for close shop liaison. There are 47 engineers in this department, under a chief methods engineer and a general supervisor of production engineering. Their group functions are broken down into: (1) Detail Manufacturing and Tooling, (2) Material Control and Storage, (3) Processing, (4) Sub-Assembly and Inspection, (5) Frame and Sheet Metal Sub-Assembly, (6) Final Assembly, Armament, Flight, (7) Electrical and Electrical Operations, (8) Salvage, Service, Protection, (9) Production Illustration, (10) Special Assignments.

The Methods staff is constantly on the factory floor, intimately in touch with all operations and with shop personnel. From this liaison there stems that continuous flow of improvements reflected in the upward curve of production per manhour and per square foot of floor space, by which Raynor gages management progress. The Methods setup is distinctive within the orbit of the writer's observation.

Within recent months improvements have been made in (a) tooling program, (b) re-arrangements and reorganization, (c) shop practice, (d) production control, (e) development of a continuous cycle. These have definitely minimized rejections, increased man-

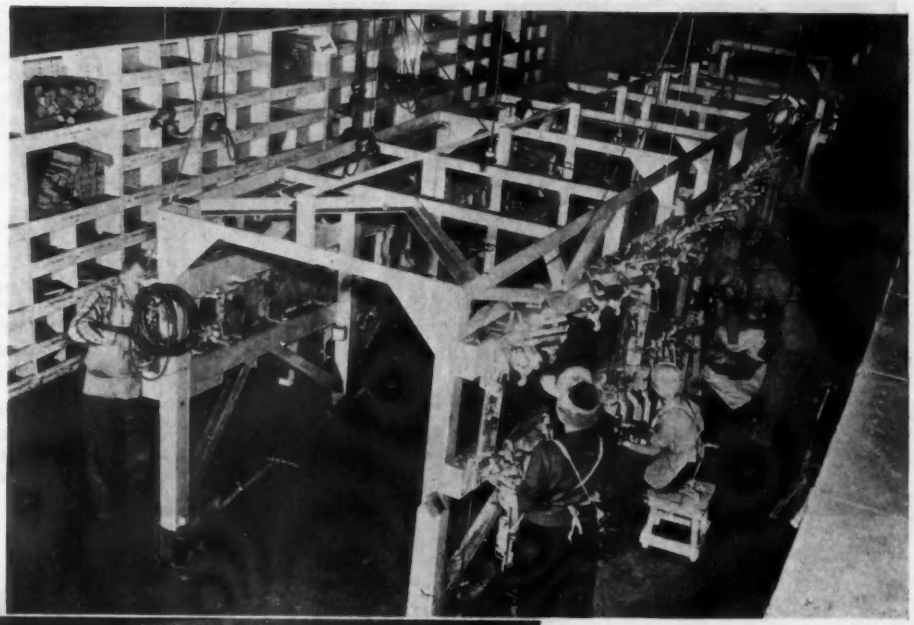
This sketch shows a suggested future horizontal assembly and drill jig operation for the center section sub-assembly department to handle skins complete from sheet stock storage rack, through router and drill to completed center section and assembly within one departmental area. This is a future refinement planned to increase quality, reduce manhours and personnel.

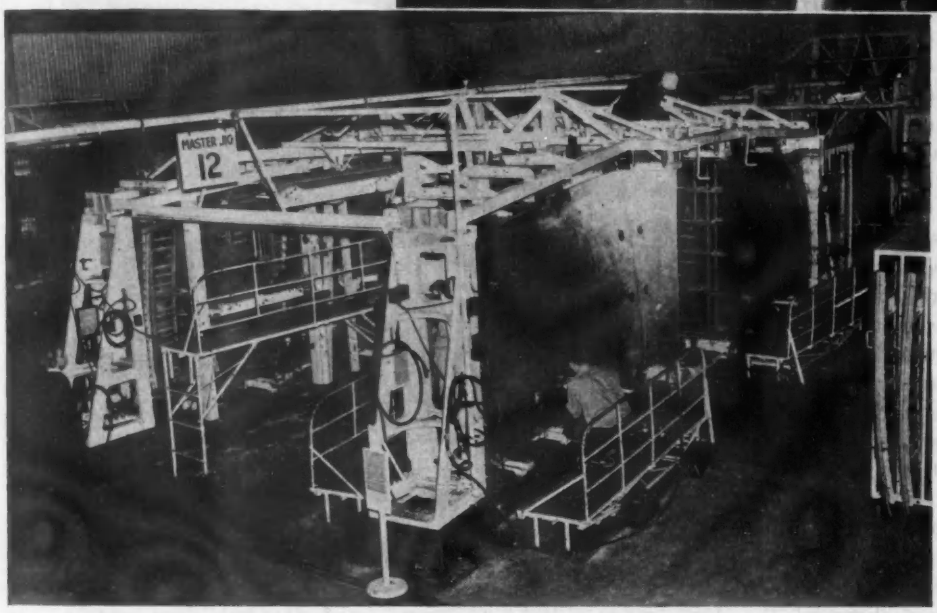


Raised

Kansas City Plant

By
Gerald
Eldridge
Stedman





A spar jig for assembling the B-25 wing center section. The employe in the immediate foreground is installing Cleco clamps, which hold the spar web to the spar caps temporarily while riveting and drilling is completed.

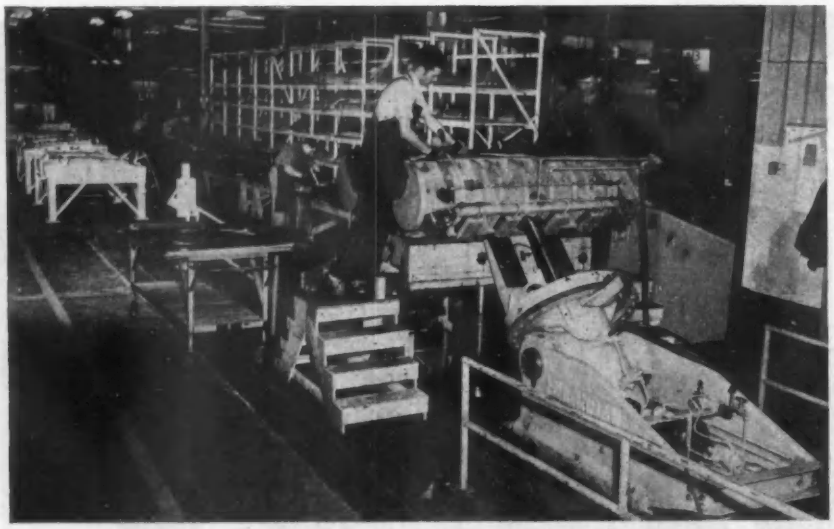
Center section jigs are moved by an overhead crane to a pick-up line, where various installations, such as landing gear struts, and hydraulic pumps, are made.

hour production and lowered the quantity of material in float.

A tooling program became standard practice. It involved preparation of a tool survey, appointment of a tool coordinator, assignment of a tool planner, composition of a tooling procedure and creation of a blanket tool order, particularly covering construction of all saw trim jigs.

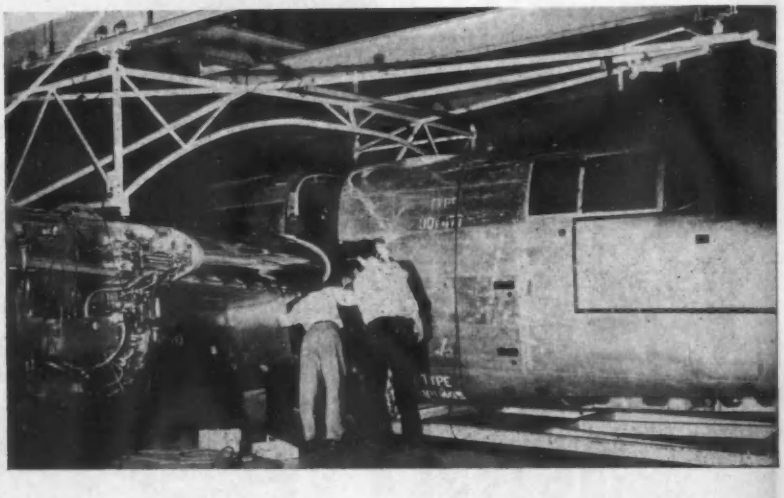
Some 500 parts were worked in the sheet metal shop, each with a different sequence of operations and usually processed in small lots, with work stations set up by operations. This initial looseness resulted in large accumulations of bulky parts in all stages of completion and in long moves between operations. Attendant weaknesses in supervision and tendencies to shift responsibilities developed. Procedure has been effectively routinized by a completely new layout which has forced the work to flow through six stations on definite schedules under control of a dispatcher. The six stations are: (1) Duct—flange router, bandsaw and burr benches, (2) Shapers—table saws and burr benches, (3) Shear Station—scribe and drill benches, Liebert shears and burr benches, (4) Planish—power and planish hammers, (5) Trim and Drill Jigs—all large trim and drill jigs, shear and burr benches, (6) Bench Form—special hand forming operations incapable of being handled at above stations. This setup assures prompt completion of each job in work, uniform workmanship, maximum occupation of worker's time without instruction, a labor and miscellaneous machinery pool, specific supervisional responsibilities, maximum flexibility, speedier flow, less "in float" material.

One of the many examples of improved setup is the reorganization of operations surrounding the Sheridan stretching presses. The Sheridan replaces manual stretching; it can stretch a 24S aluminum alloy sheet 267 in. long, 48 in. wide and .081 in. thick into con-



The Sheridan stretcher in use in the material preparation department.

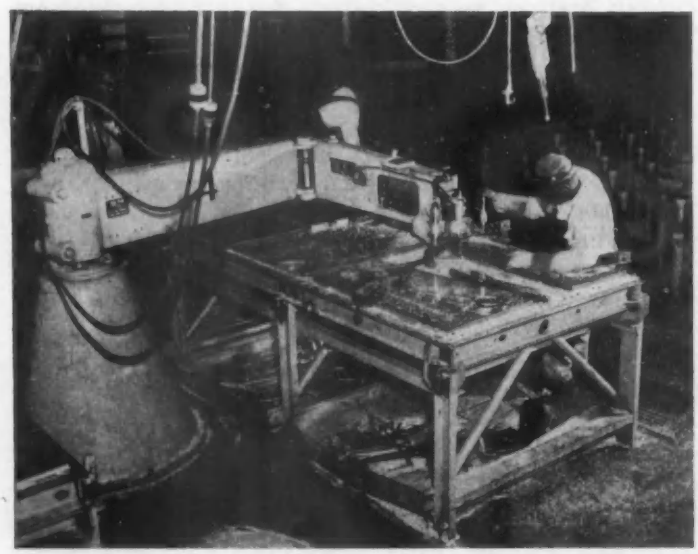
After front, center and rear sections of the B-25 Mitchell are mated in the high bay, they progress from station to station by the overhead conveyor arrangement shown until landing gear and wheels are installed and the plane is placed on a floor conveyor track. This photograph shows mating of the center and front sections of the fuselage. Note that the front section, to the right, has been rolled into place on a roller conveyor.



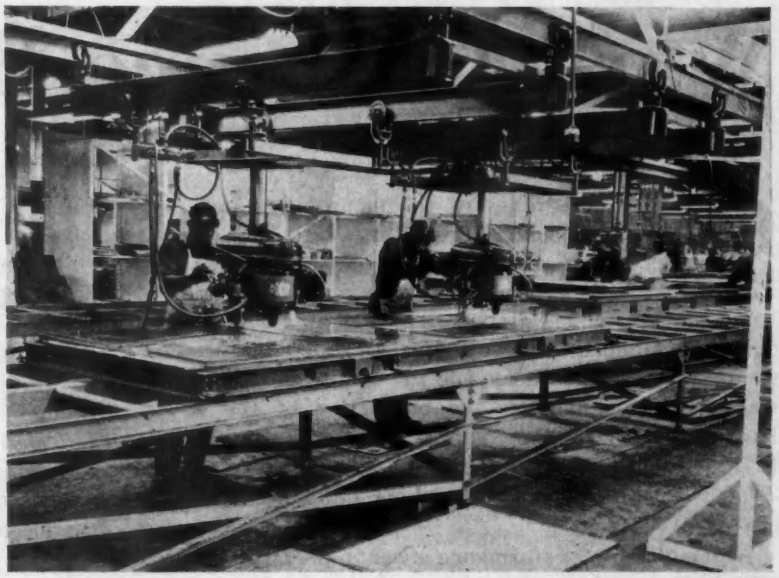
tinuous double curvature of varying radius in 1.73 minutes after overblock jaw insertion. Two 60 ton hydraulic, trunnion mounted tension cylinders are designed to facilitate the elevation of the jaw from horizontal to 15 deg. past vertical through an arc about the trunnion pin, the operation being by rack and pinion. Slide units are motor geared, rapid and precise control being accomplished by remote control panel push button. Pneumatically actuated, its 48 in. jaws do not slip or tear the work. The table block is supported on three rams; the right ram being separately controlled. This arrangement permits the block to be set at the greatest height and angle to obtain best pull.

The Sheridan is particularly adapted to such work as the stretch float of forward bottom sheets. A 12 ft. stringer was being stretched when observed, the elongation amounting to 3 in. in that operation. In this special Sheridan setup, squaring shears and punch press are positioned to trim ends and punch tool holes, without waste motion, as the skins come from the stretcher.

There have been many improvements in shop practice. For example, the Mead belt sander (¼ in., ½ in. and 1 in. abrasive belts) has supplanted file, rasp, "knife sharpeners" and other burring tools with consequent improvement in quality. Hole burring, previously done with large drill bits mounted on file handles, is now accomplished more easily by countersinks in drill presses for larger holes, stop countersinks in hand drill motors, snake adapters (for confined spaces) for smaller holes and special chisels for burr removal where scratches are not objectionable. Small radii at cutout corners are needle filed by drill motor, the motors being C clamped to



Many of these routers are used at the Kansas City plant.



Overhead tracks for these drill presses in the material preparation department gives the employe fingertip control over the drill. The Alclad sheets have been marked and the free movement of the drill enables him to hit a pinpoint mark on the sheet with little chance for error.

the benches, thus eliminating manual operation.

Portable, pedal operated pneumatic punches have replaced hand punches. These include models equipped with ¼ in. pilot for punching pilot holes in the overpress templates.

Operator instruction sheets, describing each operation in detail (with sketch) have removed variations in technique between day and night shifts.

Ingenious adaptations have been made, such as the conversion of a No. 450 Chicago pneumatic riveting machine into an excellent numbering machine. Extensive use of Strippit punches has been made for extrusions and sheet metal. This work is set up on special jigs and involves the use of Wales dies in a clamped fixture which has saved much drilling. To relieve load on the 4 ft. brakes, Perkins Junior punch presses are used. These are fitted with dies and have automatic feeds for large orders of small parts. A hand router jig is coming into use. This is a steel nest over Hydrocal and serves as both a drill and trimming jig. The Onsrud ¼ to ½ hp hand router is used. Extensive use of band saw jigs of Kirksite, Hydrocal, Plasteloid, with sawing edges faced in steel, is also effecting production improvement. A novel NAA method to increase worker sense of machine responsibility and care is that of tagging every machine with a sign showing its cost. Example: "Bliss, 350 T Press, cost $26,500—Take Care of It."

A program was installed recently to produce profiled parts more economically by conserving material and manpower through rearrangements of the router setup by placing all possible parts in nested layouts, thus utilizing maximum area of aluminum sheets. Manpower has been conserved by special job assignments that have developed specialized worker expertness. The system keeps machines busy all of the time

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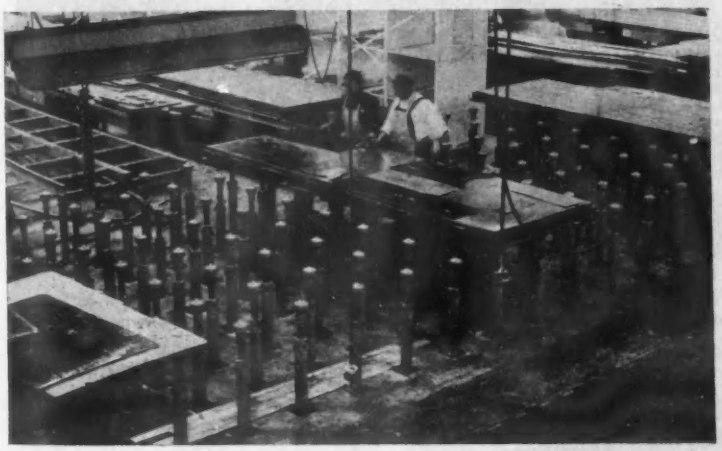
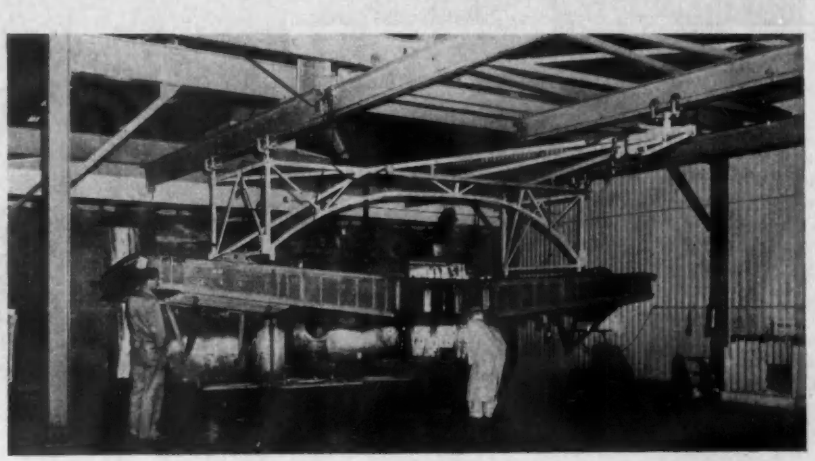


Ball-bearing topped steel posts simplifies the movement of Alclad sheets.



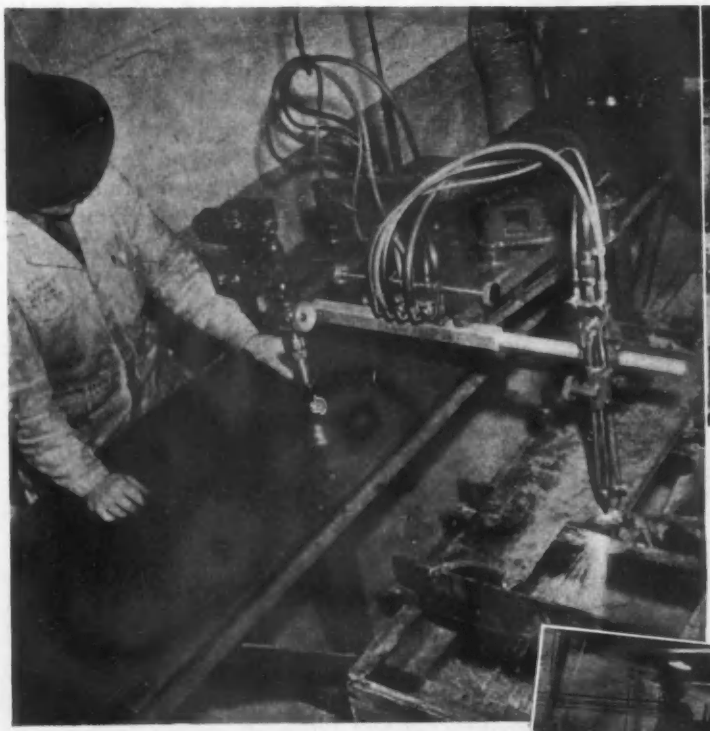
A completed B-25 Mitchell center section assembly travels by overhead conveyor from the pick-up line, where landing gear struts, hydraulic pumps and similar equipment have been installed, to the beginning of an installation line. At the end of this assembly line, it will be ready for mating with front and rear sections of the Mitchell.

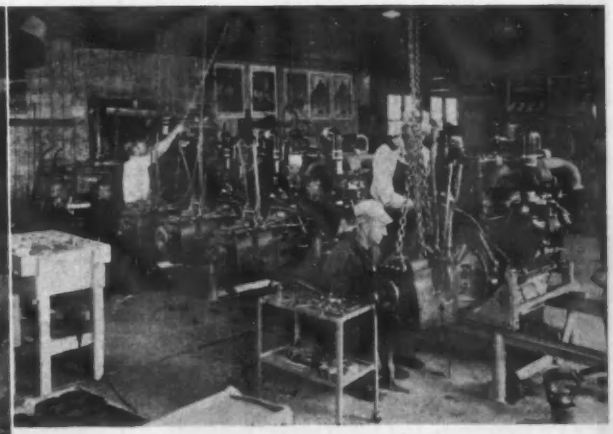
Ward LaFrance Builds Army

CRADLED in the valley of the mountain region of upper New York State, the Ward LaFrance Truck Div., Great American Industries, Inc., of Elmira, N. Y., has been noted as a manufacturer of heavy duty commercial trucks and custom-built fire-fighting equipment for over 25 years. That this background of specialization made the company eminently well fitted to undertake the production of the M-1 Heavy Wrecker for the Army is attested by the facts. In 1943 Ward LaFrance delivered to the Army $17,250,000 worth of vehicles; and $3 million worth of spare parts.

Although this performance dwarfs peacetime records by comparison, the job was done with the same executive personnel and the same type of labor as before. Even the basic plant has remained the same, save for additions, comprising neighboring buildings which were taken into the fold and equipped for handling special operations.

While production of the Heavy Wrecker at Elmira is essentially an assembly operation, the major units, in the interest of standardization, coming from a group of some 75 to 80 vendors, including Continental for engines, Fuller for transmissions, Timken for axles, etc., many machine and manufacturing operations are done in their own plant. Thus only one of the major functions of engineering and management has been the selection of units and sources, the establishment of specifications, the scheduling of components, and a constant policing of schedules so as to meet





(Above)—View in sub-assembly department. In the foreground is the assembly line for the final preparation of engines—installation of accessories, transmission, and other attachments.

(Above)—In the frame assembly department—close-up of Airco automatic flame-cutting machine, one of the hardest working pieces of equipment in the plant.

(Right)—Vehicles about ready for delivery. Here is shown the operation of winding cable on the hoist mechanism of the vehicle.

Heavy Wrecker

By Joseph Geschelin

the demands of the Army. During the course of the war, this operation has had its ups and downs depending upon the flow of components from the outside. At one stage, the company hit a peak month's output of $3 million in vehicles alone.

Even an assembled vehicle requires many special operations in the assembly plant. For example, the variety of frame castings, cross members, forgings and special fire apparatus items are machined in a well-organized machine shop. Although the blank frame side rails and cross-members are purchased from the outside, the parts are machined and the frame is assembled here. Too, there is a sizable welding department, comprising Hobart arc welding booths, Airco automatic torch cutting machines, oxy-acetylene welding equipment for producing a variety of welded fabricated parts and sub-assemblies, also sheet metal, upholstering, wood-working and painting departments for both trucks and fire apparatus.

It may be appreciated that a plant of this character relies to a great extent upon individual skills, possessed to a remarkable degree by the workers who have lived with the organization for many years. Moreover, the custom building of heavy duty vehicles implies improvization of methods and simple equipment to a large extent. Indeed, these are the outstanding characteristics of Ward LaFrance.

For postwar, the company intends to continue as a major producer of fire fighting equipment and special-

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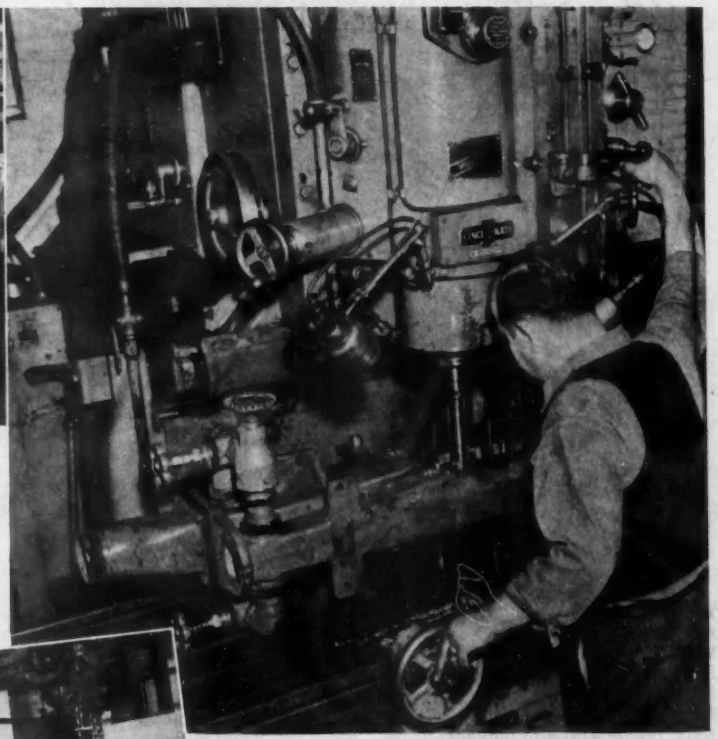
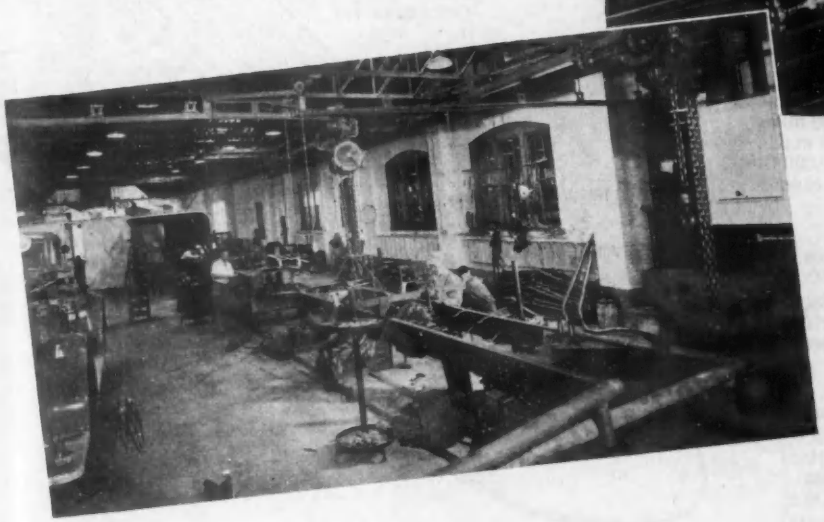


(Above)—End of the final assembly line showing the two parallel lines with vehicles emerging from the paint spray booths.

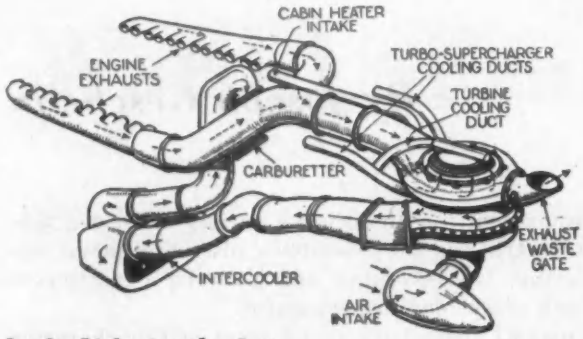


(Above)—In the machine shop—one of the most modern pieces of equipment found here is this single-spindle Cincinnati Hydro-Tel used for production jobs. This department also contains a battery of Cincinnati Duplex mills.

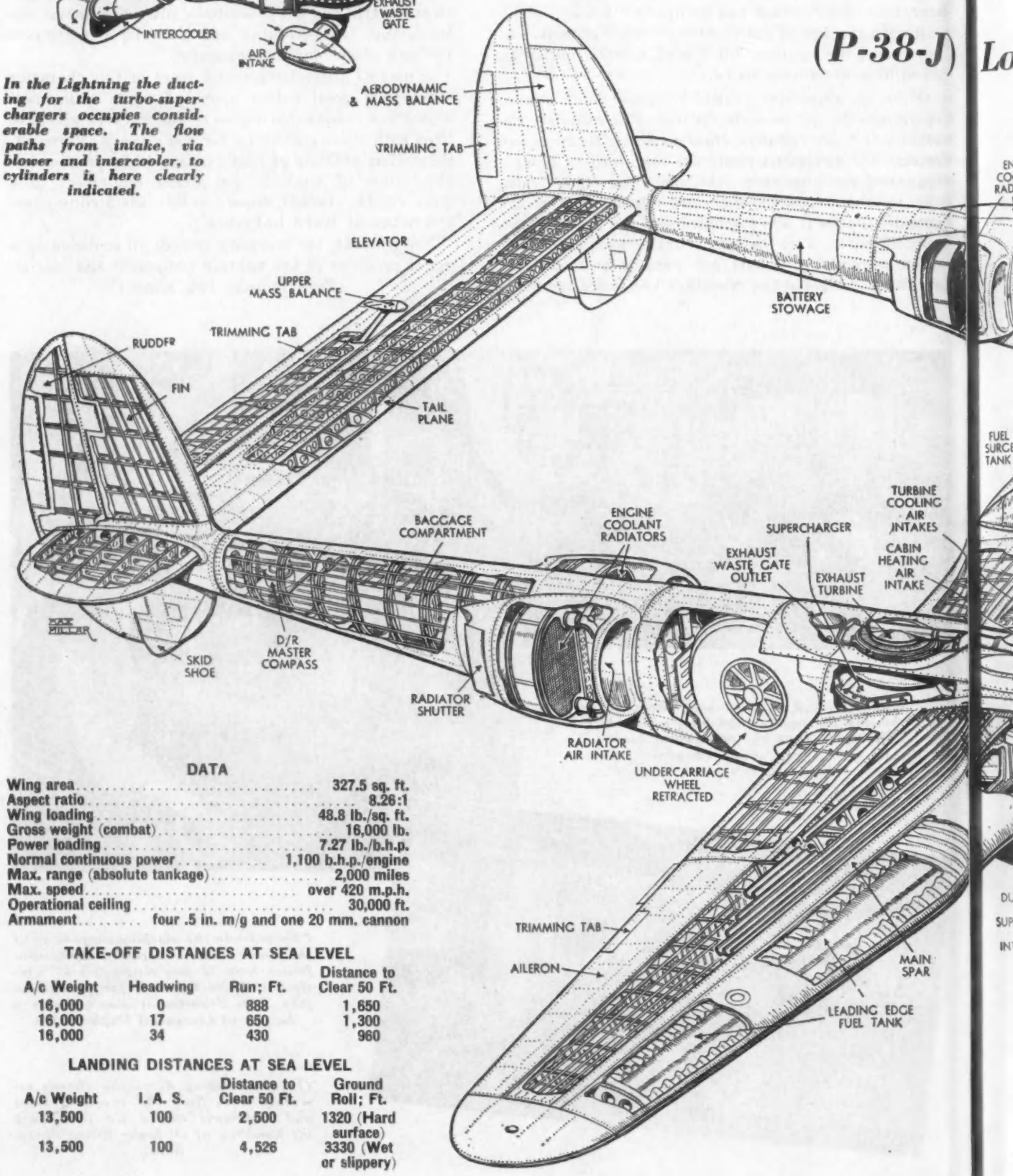
(Left)—Looking down the chassis assembly line. Note the overhead hoist and craneways spaced for facilitating the handling of all heavy lifting operations.

Lockheed

(P-38-J)



In the Lightning the ducting for the turbo-superchargers occupies considerable space. The flow paths from intake, via blower and intercooler, to cylinders is here clearly indicated.



DATA

Wing area	327.5 sq. ft.
Aspect ratio	8.26:1
Wing loading	48.8 lb./sq. ft.
Gross weight (combat)	16,000 lb.
Power loading	7.27 lb./b.h.p.
Normal continuous power	1,100 b.h.p./engine
Max. range (absolute tankage)	2,000 miles
Max. speed	over 420 m.p.h.
Operational ceiling	30,000 ft.
Armament	four .5 in. m/g and one 20 mm. cannon

TAKE-OFF DISTANCES AT SEA LEVEL

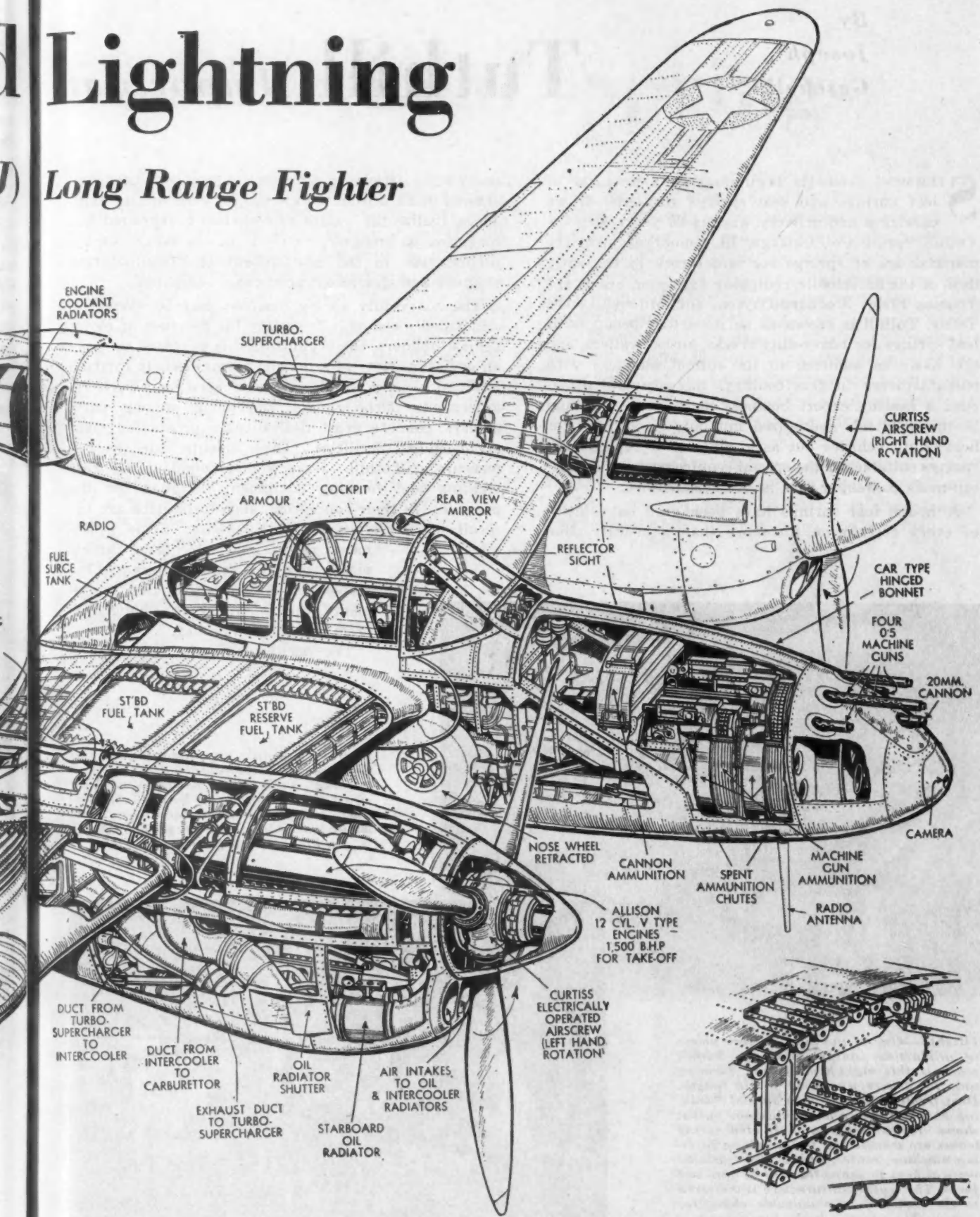
A/c Weight	Headwing	Run; Ft.	Distance to Clear 50 Ft.
16,000	0	888	1,650
16,000	17	650	1,300
16,000	34	430	960

LANDING DISTANCES AT SEA LEVEL

A/c Weight	I. A. S.	Distance to Clear 50 Ft.	Ground Roll; Ft.
13,500	100	2,500	1320 (Hard surface)
13,500	100	4,526	3330 (Wet or slippery)

Lightning

Long Range Fighter



Drawings used by courtesy of FLIGHT, London.

Sketch of main spar pick-up outboard of booms. The corrugated stiffening is skinned on both sides at fuel tank locations, as shown in the detail.

By
Joseph
Geschelin

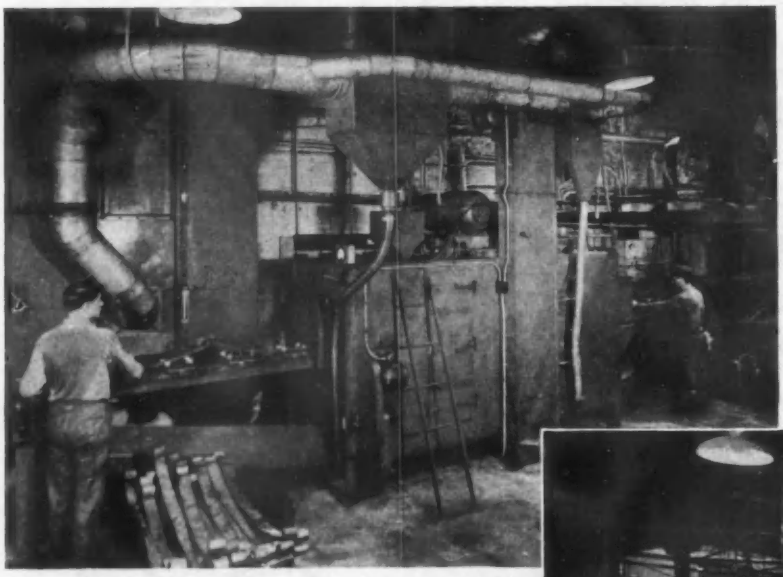
Tuthill *Important*

STEMMING from its beginnings as a producer of leaf springs and seat springs for horse-drawn carriages and delivery wagons 65 years ago, the Tuthill Spring Co., Chicago, Ill., embarked upon the manufacture of springs for motor cars in the early days of the automobile, equipping such pioneers as the Thomas Flyer, Stoddard-Dayton, and Mitchell-Lewis. Today, Tuthill is known as an important producer of leaf springs for heavy-duty trucks, buses, trailers, and the like. In addition to its normal business with manufacturers in this country, the company developed a healthy export business many years ago and in this field has specialized not only in springs for heavy-duty vehicles but as a supplier of replacement springs suitable for the special requirements of American-made passenger cars in overseas service.

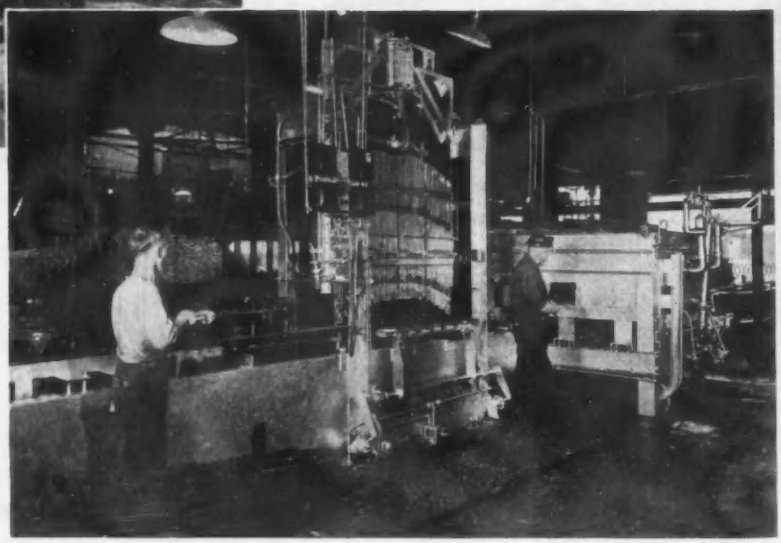
Although leaf springs have been used on vehicles of every description for more than a century, like many other articles in common use they have been considered quite prosaic. Few people, even among engineers, realize the wealth of technical background and invention encompassed not only in the design of the product but in the development of manufacturing methods and specialized production equipment.

The heavy-duty spring business may be likened to a glorified job-shop. To satisfy the demands of motor vehicle builders, the organization is prepared to make an endless variety of sizes and forms, usually in small lots and even in single pieces if need be. Such requirements, although not uncommon among parts makers, connote great flexibility in production management and facilities. These talents exist in full measure at Tuthill. Here will be found unique heat treating and forming equipment designed for the purpose. In their conception, such techniques are the result of specialization for 65 years. Some equipment is designed to make single pieces, one at a time; others are examples of flexible production equipment capable of rapid changeover from one job to another.

The backbone of the operation is



(Left)—Example of modernity is this American Wheelabrator unit for "shot-peening" such spring leaves as are specified for this treatment by the customer. Parts are placed on the conveyor chain shown at the left for passage through the machine, discharging at the right.



(Right)—One of the most modern pieces of production equipment in the Tuthill plant is this eight-head spring forming unit for leaves up to 62 in. in length. Heat treating is done in a special "walking beam" furnace with side door outlet, shown in the background. Heated spring leaves are transferred to the spring forming machine, center, which has adjustable vertical keys to shape the leaf to a master form. The leaves, in turn, are transferred to the forms on the movable chain for quenching in the bath, foreground.

Producer of Leaf Springs

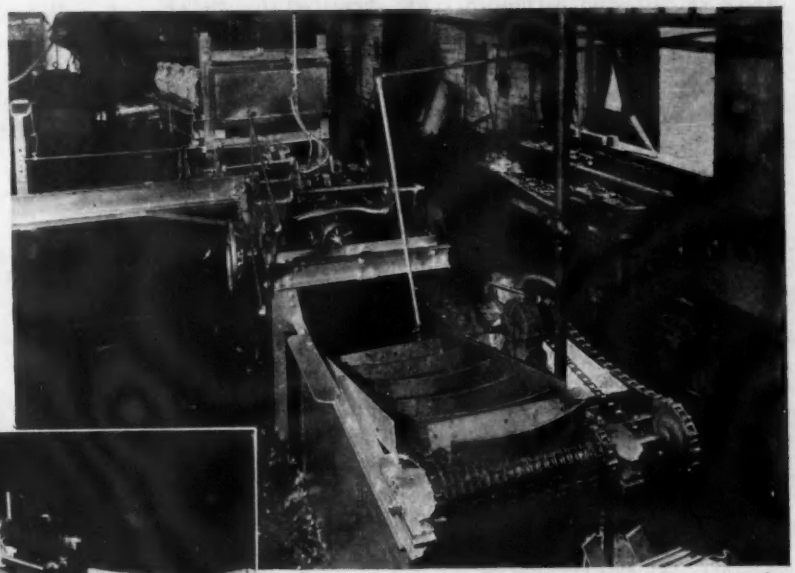
the staff of skilled spring makers who learned their trade many years ago. During the war these key men have been supplemented by relatively inexperienced people who have been trained to assist the experienced men and to operate some of the more automatic machinery. As an example of modernity we can point to the adoption of the latest type "shot-peening" technique to increase the fatigue life of springs. This equipment is available for use where specified by the customer. Although the plant is small and compact, some of the burden of materials handling has been effectively relieved by the use of the new Automatic Transporter, a small industrial truck with a front wheel power drive.

The material in general use for making motor vehicle springs is Silico-manganese steel, SAE 9260. After suitable heat-treatment, it can be expected to show by laboratory tests tensile strength of over 200,000 psi; elastic limit in excess of 170,000 psi, with reduction of area of 25 per cent. It is usually received in bars 25 to 30 feet long which are sheared to the lengths required for each individual leaf.

The main leaf is sent from the shear to the "eye machine," where the ends are heated and rolled up to form an eye on each end. A "single operation" eye machine will scarf, roll up, and "size" the eye by inserting a sizing pin, at a rate of better than ten eyes per minute. Small lots usually are made on a "three operation" machine which is slower but easier to set up. These leaves are punched for the center bolt, either hot or cold, depending upon the thickness of the stock. Rivet holes also are punched and countersunk for rebound clips. The ends of the leaves usually are diamond pointed or they may be tapered to a thin edge in a tapering roll.

Forming and hardening usually are done in one operation on specialized machines. Short leaves (up to 18 in. long) are heated to 1620 F in a continuous walking beam type furnace, using gas for fuel. At

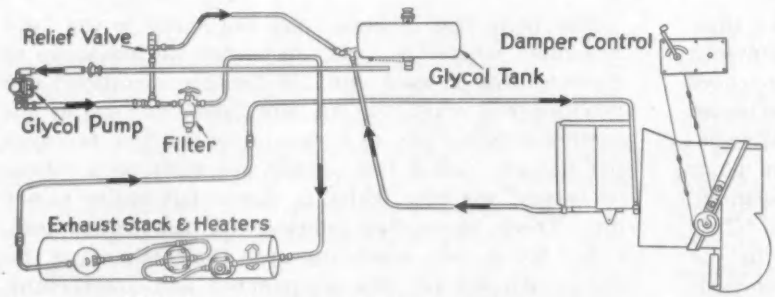
(*Turn to page* 82, *please*)



(Below)—Another of the basic operations on spring leaves for heavy duty springs is shown here. This is the tapering roll for tapering leaf ends. The leaves thus treated are first heated in the furnace at the left.

(Above)—Smaller leaves—up to 17 in. in length—are handled in this short plate heating, forming, and quenching unit at the rate of 24 plates per minute. The heat treating furnace is of "walking beam" type with automatic temperature control. Plates are fed from the furnace into the forming station by an "iron man" device. Formed plates drop onto the conveyor belt for quenching in an oil bath in which the oil is recirculated and cooled.

Flying Fortress Equipped with Glycol



Diagrammatic drawing of glycol system

IN THE article, "Aircraft Heating Systems of Three Types," which was published in the June 15 issue of AUTOMOTIVE AND AVIATION INDUSTRIES, a description was given of the steam, exhaust-hot air and internal combustion systems and their installations in Douglas airplanes. For heating the B-17F Flying Fortresses, engineers of the Boeing Aircraft Co. designed a glycol system consisting of main and auxiliary units, both of which operate on the same principle of heat exchange.

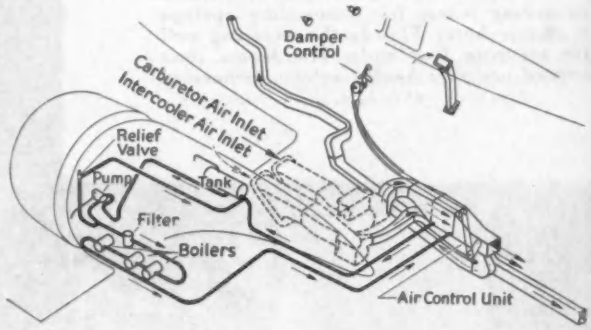
Main System

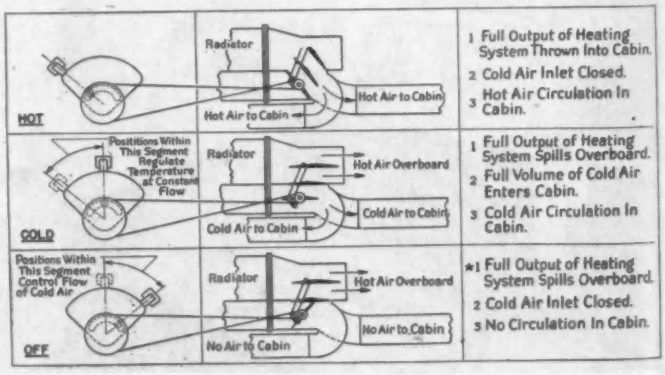
The Fortress main system is supplied with hot air which is transferred to the cabin from a glycol system installed in nacelle No. 2. The heating system fluid, a glycol solution of 55 per cent diethylene glycol and 45 per cent ethylene glycol by weight, is stored in a tank located in the top of nacelle. The glycol flows from the tank to the engine-room pump which circulates the fluid at a rate of 55 to 60 U.S. gallons per hour. The flow is directed to a filter which removes impurities from the fluid, the glycol then being pumped through three heaters, which are installed in series and located in the exhaust stack, where it conducts the heat furnished by exhaust gases. A relief valve, located between the pump and filter, bypasses the glycol back to the supply line if high pressure is built up in the system during cold weather, or if the heaters are clogged.

The circulation of the glycol is continuous and therefore it must be constantly cooled. For this purpose a radiator is installed between the spars in the left hand wing gap. Ram air from the intercooler air inlet absorbs heat from the glycol at the radiator, and passes through the radiator and into the cabin. The cooled glycol passes into the supply tank. A controllable damper in the radiator may be operated to spill the air overboard if desired.

Auxiliary System

The auxiliary heating system of the Boeing Fortress uses the same principle of heat exchange as that employed by the normal heating system and has a heater unit, filter, relief valve, pump and supply tank installation in nacelle No. 3 identical to the corresponding installation of the main heating system in nacelle No. 2. Eight radiator-fan assemblies are connected by glycol tubing to the heater units in nacelle No. 3. Five of these are the non-recirculating type (external





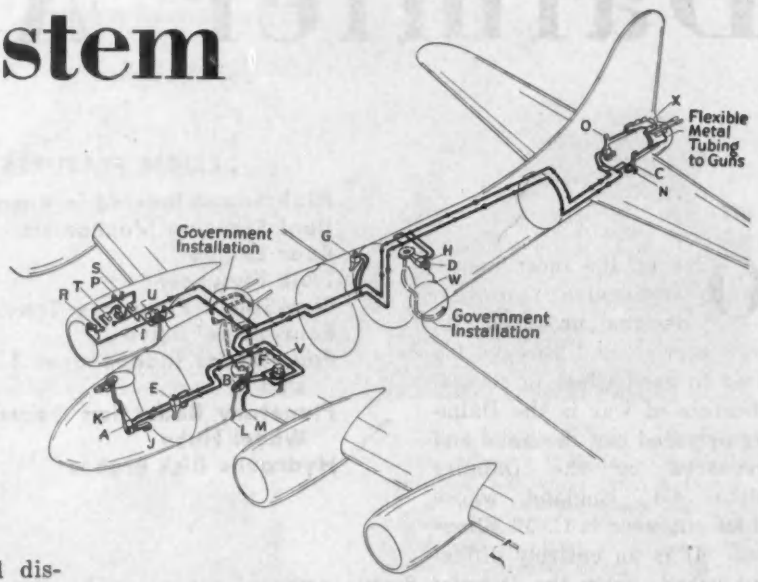
Operation diagram for main heating system

The glycol system operates continuously regardless of the position of heating controls. The flow of hot air must therefore be unrestricted to prevent damage to the glycol system. Heating controls must be in "off" position for all ground operation of engines.

Heating System

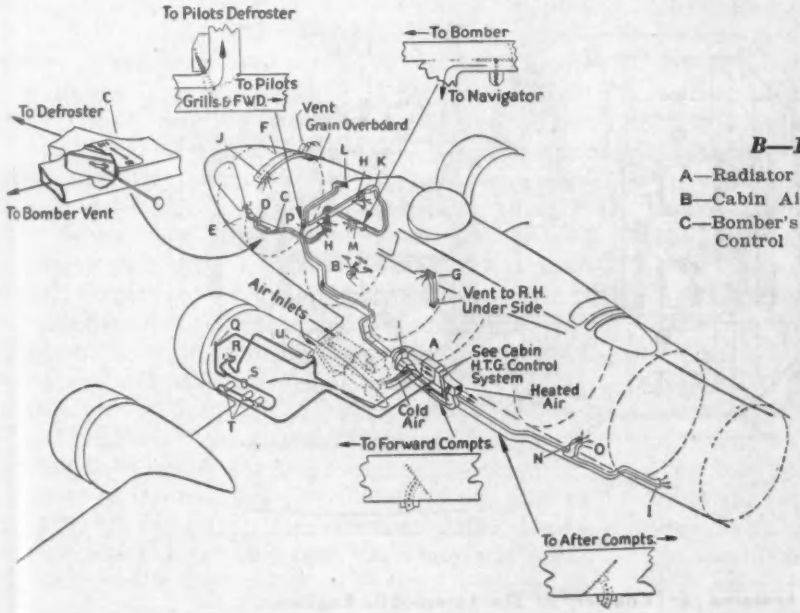
radiator air supply) and the remaining are the recirculating type (internal radiator air supply.) The non-recirculating type radiator-fan assemblies are located in the astrodome, top turret, ball turret, and tail gun enclosure. Each of these assemblies has a hand operated damper which directs the flow of heated air to the guns and/or windows, or spills it overboard. The recirculating radiator-fan assemblies are provided with overboard discharge ducts and damper type controls for regulating the amount of heated air admitted to the pilots', navigators', and radio operator's compartments. Electric fan control is automatic.

Two thermo-switches, mounted on the glycol tubing under the flow of the pilots' compartment, turn five non-recirculating radiator fans "ON" at 177 C and the three recirculating radiator fans "ON" at 77 C. The thermo-switches are capable of functioning when the master switch is "ON."



B—17F auxiliary heating system

A—Radiator Assy., Astrodome
B—Radiator Assy., Upper Turret
C—Radiator Assy., Tail Turret
D—Radiator Assy., Ball Turret
E—Radiator Assy., Navigators Heater
F—Radiator Assy., Cockpit Heater
G—Radiator Assy., Radio Compartment
H—Defroster Intake, Ball Turret
J—Defroster Intake, Astrodome
K—Defroster Exhaust, Astrodome
L—Defroster Intake, Upper Turret
M—Defroster Exhaust, Upper Turret
N—Defroster Intake, Tail Turret
O—Defroster Exhaust, Tail Turret
P—Relief Valve
R—Pump
S—Filter, Glycol
T—Heaters, Glycol
U—Tank (Capacity, 1 U.S. Gal. or .86 B.I.G.)
V—Thermoswitch
W—Drain
X—Defroster, Tail Gunner's Window



B—17F Main heating and ventilating system

A—Radiator Assy.
B—Cabin Air Control
C—Bomber's Air & Defroster Control
D—Bomber's Air Duct
E—Bomber's Window Defroster
F—Bomber's Compt. Vent
G—Pilot's Ventilating Duct
H—Pilot's Air Control
I—Lower Gunner's Heating Duct
J—Bomber's Compt. Grill
K—Pilot's Air Duct
L—Pilot's Defroster & Control
M—Navigator's Air Control & Outlet
N—Radio Compt. Air Control
O—Radio Compt. Air Outlet
P—Air Shutter Valve
Q—Relief Valve
R—Pump
S—Filter
T—Heaters
U—Tank

Daimler Armored

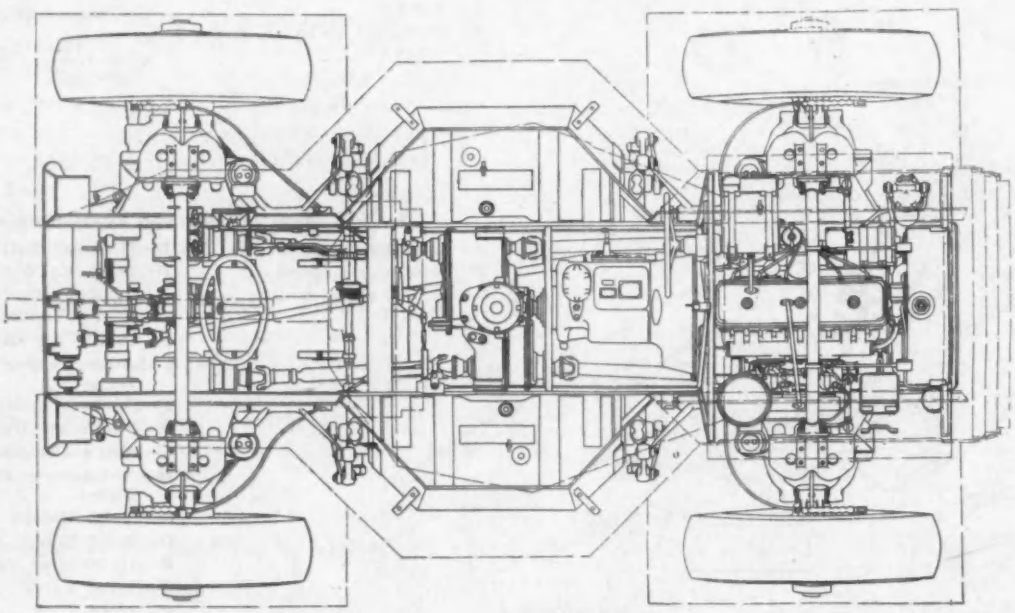
DESIGN FEATURES

High Speed Driving in Reverse
Dual Steering Mechanism
Rear Engine
Fluid Flywheel
Five-Speed Planetary Transmission
Four-Wheel Drive
Four-Wheel Independent Suspension
Planetary Reduction Gears in Wheel Hubs
Hydraulic Disk Brakes

ONE of the most unconventional automobile designs produced for war service and successfully used to good effect in several theaters of war is the Daimler armored car, designed and produced by the Daimler Motor Co., England, whose chief engineer is C. M. Simpson. It is an entirely different vehicle from the Daimler Scout (armored reconnaissance car) described and illustrated in AUTOMOTIVE AND AVIATION INDUSTRIES of June 1, 1943. Intended for an entirely different purpose, it is more heavily armored and armed, and is essentially a combat vehicle. Like the Scout car in 1938, when the design work on both types was started, the armored car passed from the drawing board to the prototype stage in six months. In a revolving turret, this unique product carries two guns as its main armament, a high-velocity 2-pounder quick-firer and a 7.9 mm. Besa machine gun on a co-axial mounting. In addition it has a Bren gun carried on an anti-aircraft mounting.

One of the outstanding features of this vehicle is its duplicated steering control, by which it can be driven from either front or rear by the appointed driver in front or by the commander from the interior of the turret. This feature enables it, when necessary, to be driven in reverse at any speed up to the forward maximum; the transmission provides five speeds both forward and reverse.

The six-cylinder engine is at the rear and drives the four wheels through a Daimler fluid flywheel, a preselective five-speed transmission and a transfer and differential gear-box, from whence four propeller shafts issue and pass to a sprung spiral bevel reduction gear at each "corner" of the chassis. The crown bevel gear in each case is coupled to a Tracta constant-velocity universal joint, whence the drive is carried by a short coupling shaft, through a second Tracta joint, to the sun wheel of planetary reduction gears within the road wheel hub. All wheels of the new Daimler

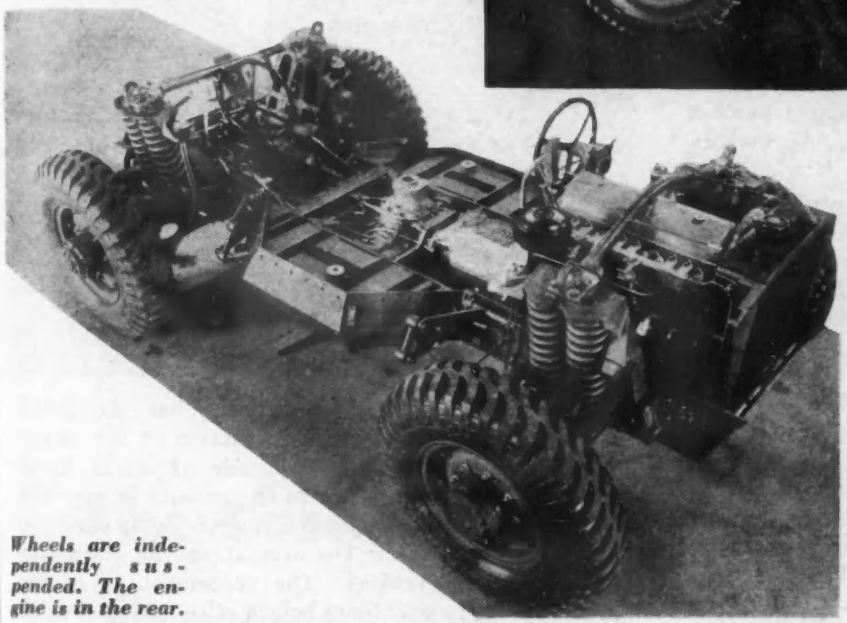


Plan view of the Daimler armored car (Courtesy of **The Automobile Engineer, London***).*

Car

By M. W. Bourdon
Special Correspondent of Automotive and Aviation Industries in Great Britain

Daimler armored car with full circle turret. Weight completely equipped 7.0 tons; overall length 13 ft. and overall width 8.0 ft.; wheelbase 8.0 ft. 6.0 in. with track 6.0 ft 6.0 in. Excluding the periscope the overall height is 13 ft.



Wheels are independently suspended. The engine is in the rear.

war model have independent suspension.

The chassis frame resembles a flat-bottomed tray of armor plate, giving protection to the components above it on rough ground, for it should be realized that this is a vehicle capable of use over exceptionally rough country, as well as on hard roads. At the approximate center of the frame on each side of the chassis is an armor plate "blister" containing a fuel tank. The two tanks hold 36 Imperial gallons.

The superstructure, of heavy armor plate, welded throughout, is bolted to the chassis frame at many points to secure rigidity of the vehicle as a whole. The exterior design is such as to present the smallest possible target area, to offer a glancing surface to projectiles and to be proof against penetration or other damage by anything smaller than an anti-tank gun. The turret will traverse a full circle, and the two-pounder gun within it, like the co-axially mounted Besa, is capable at any point of traverse of being elevated or depressed to the full range of the mounting.

Typical of Daimler practice, though modified as required by its special service, the six-cylinder engine, developing 100 bhp at 3600 rpm, has a bore and stroke of approximately 3¾ by 4¾ in., giving it a piston displacement of about 316 cu in. Inclined overhead valves have pushrod operation from a chain driven camshaft. The four-bearing crankshaft is counter-weighted and has a vibration damper. Steel connecting rods have fixed wrist pins for the aluminum pistons.

The crankcase is shallower than standard to give more ground clearance, and with the same object a dry sump system of lubrication is used, with a twin gear type oil pump at the lower end of an inclined driveshaft which, at its upper end, drives the distributor of the fully screened ignition. Upon returning to the sump after circulation by the pressure side of the pump, the oil is picked up by the scavenging section and passed through an oil cooler on its way back to the main tank.

Twin Solex non-spillable carburetors take their supply of air through an oil-bath type of air cleaner and deliver their mixture through a manifold heated and temperature-controlled by water from the radiator bypass thermostat. The radiator is behind the engine, just forward of slots in the rear panel of the superstructure through which air passes from the fan.

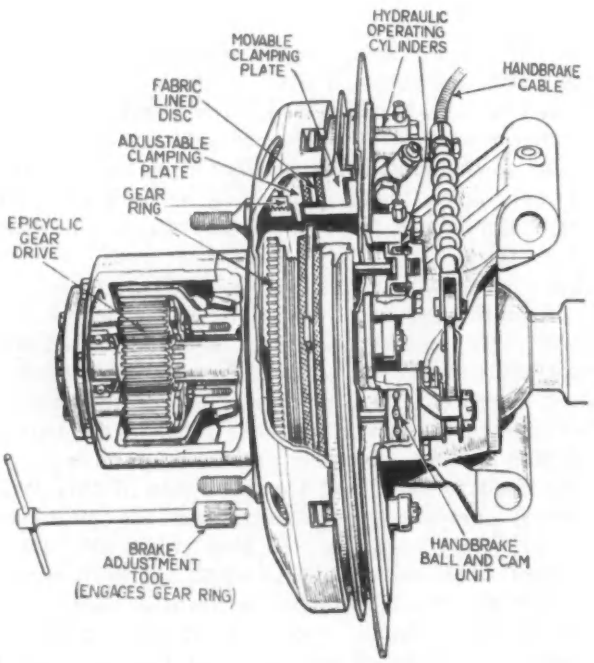
The fluid flywheel and the five-speed Wilson type planetary pre-selective transmission are unit-constructed with the engine; the gear ratios are: 1st—8.74, 2nd—4.89, 3rd—2.53, 4th—1.62 and high direct. The fluid flywheel is of improved Daimler design. It is of the "open circuit" type and differs from earlier designs in that the oil circulating vortex has an oval cross-section instead of the circular shape as previously. Another difference is the elimination of the annular guide ring of the driving member.

Bolted to the rear of the transmission is a transfer and differential casing, transmitting forward and reverse drive to a central differential gear operating between the wheels on the right-hand and left-hand sides respectively. From the differential the drive passes to a train of gears on either side; to these the front and rear propeller shafts are coupled for the transmission of torque to the final drive, the casing of which is bolted to the frame alongside each wheel and the planetary gears in the hubs.

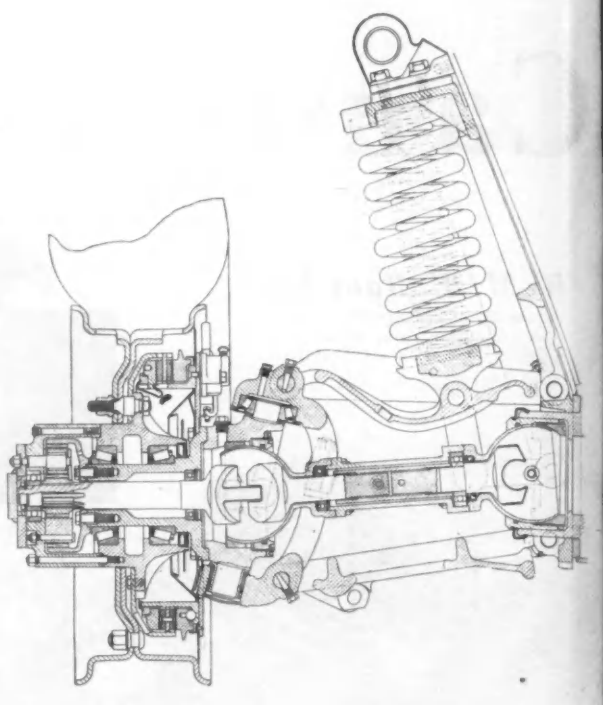
This arrangement of the differential and the use of four propeller shafts serves three purposes; it gives the maximum possible ground clearance on the longitudinal center line of the chassis (the propeller shafts running close alongside the frame sides, while the final drive casings are beside the engine at the rear); it limits the load conveyed by each shaft to the torque that can be transmitted through one road wheel and it provides the best possible guarantee against wheel spin, for the latter cannot occur unless both wheels on one side spin simultaneously.

Originally another differential was fitted on each side, operating between the front and rear wheels, but this was found to be unnecessary and was eliminated. Another original feature omitted before large scale production commenced was four-wheel steering; this also was found unnecessary.

The object of the planetary gearing in the hubs is to avoid the need for transmitting the high torque on the lower gear ratios through large-reduction gears and the axle drive shafts. The reduction in first gear, enabling the vehicle to climb a 50 per cent grade, is 80 to 1 and the provision of a 3.5 to 1 reduction in the hubs greatly reduces the load imposed upon the final drive coupling shafts and their Tracta joints. These planetary gears can be removed if need be without detaching the wheel; each has six planet wheels, thus effecting wide distribution of the load.



Sectional view of the wheel hub with planetary gearing and disk brake (Courtesy of* The Auto-Car, *London).



Front wheel drive, steering and suspension (Courtesy of* The Automobile Engineer, *London).

An exceptionally wide amplitude of wheel movement vertically in relation to the chassis is provided by the independent suspension, i.e. 10 in. upward and 6.0 in. downward from the normal, on the stationary and fully laden vehicle. The suspension is of the "wishbone" type with dual helical wire springs, which act through levers so arranged as to effect grading of spring resistance.

Each disk brake, hydraulically activated and of Girling design, comprises an annular disk, with friction facings, free to move laterally but rotating with the hub. The back plate carries a normally fixed but laterally adjustable pressure plate on one side of the annual disk and a laterally floating annular pressure plate on the other side. Radially, at 90 deg apart, pairs of hydraulically operated plungers engage the floating pressure plate in a lateral direction. On the opposite diameter to these plungers is a series of steel balls in conical seats. When hydraulic pressure is applied the plungers force the floating pressure plate into contact with the rotating disk; the latter then commences to carry the pressure plate around with it. This slight movement causes the diametrically opposite side of the pressure plate to ride up on the steel balls and cause it, with self-servo effect, to apply uniform pressure to the disk and exert friction grip on it between the two pressure plates.

The hand brake applies to all four wheels with separate mechanical operation by balls and cams. In order to increase the leverage without excessive movement of the hand lever the latter operates through a pawl and continuous ratchet wheel, so that the brakes can be applied, if necessary, by more than one stroke

(*Turn to page* 100, *please*)

Projections of the spectrum of a steel sample being studied by the spectroscopist.

The Case Against "Tramp" Elements

Ten minutes after a sample of steel is delivered to the Inland laboratory its chemical content is clearly and permanently recorded on spectrographic film. This film is greatly enlarged by projection, and is studied by the spectroscopist. There is not a chance for any "tramp" element to pass undetected.

The apparatus by which these checks are made is known as a spectrograph. A small specially prepared sample of steel is placed in the apparatus, where it is quickly vaporized by an electric arc, and the spectrum recorded on photographic film.

Inland uses the spectrographic laboratory for frequent and rapid tests while heats are being made. But this is only one of the many methods used by Inland to control the quality of steel—steel that is uniform from order to order—steel that is easily fabricated with minimum wastage.

Sheets • Strip • Tin Plate • Bars • Plates • Floor Plates • Structurals • Piling • Rails • Track Accessories • Reinforcing Bars

INLAND STEEL COMPANY

38 S. Dearborn St., Chicago 3, Ill.

Branch Offices: Cincinnati • Detroit • Kansas City • Milwaukee • New York • St. Louis • St. Paul

Production Experience— Milling Steel with

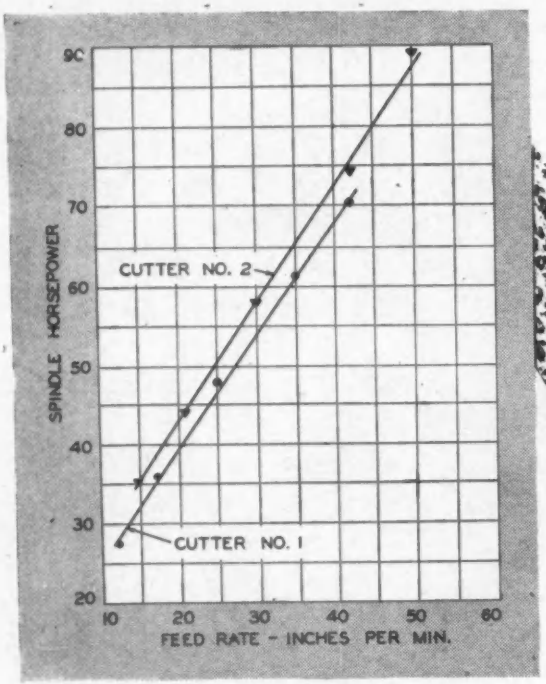


Fig. 1—Relationship between spindle horsepower and feed rate.

Machine—50 CSM vertical
Spindle hp.—50
Feed motor hp.—5
Depth of cut—0.325
Material hardness—210 BHN

CUTTER DATA

CUTTER NO. 1:
Tip material—K3H Kennametal
Brazed to C1 body
No. of teeth—12
Diameter—10 in.
Speed—180 R.P.M
Angles—7 deg. neg. Helix
" " " rake
15 " lead

CUTTER NO. 2:
Tip material—K3H Kennametal
Brazed to C1 body
No. of teeth—14
Diameter—12 in.
Speed—146 R.P.M.
Angles—same as above

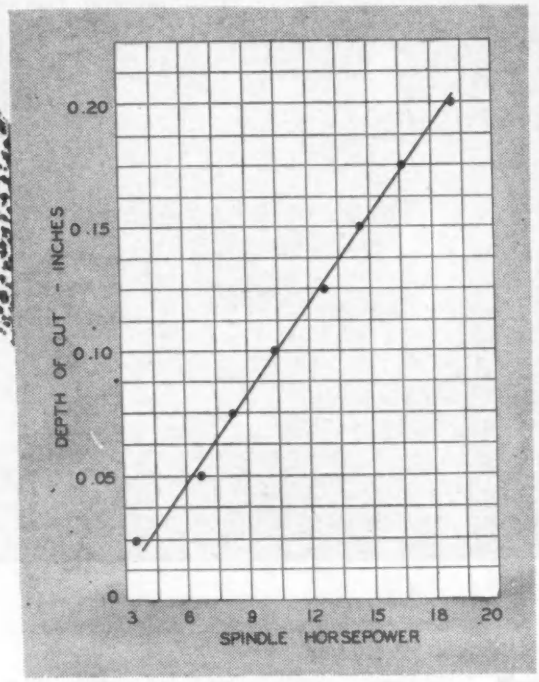


Fig. 2 — Relationship between spindle horsepower and depth of cut using negative angle milling cutter.

Machine 2408 simplex
Spindle motor—20 hp.
Spindle speed—205 R.P.M.
Feed rate—29.75 I.P.M.

CUTTER DATA:
Diameter—8 in.
No. of teeth—12
Angles—7 deg. neg. rake
" " " helix
15 " lead
Type—wedged inserts
solid carbide
Tip material—KM Kennametal
Hardness—210 brinell

THE technique of milling steel with carbide is presently limited to the use of negative angles both in the rake and the helix. This is not true if we included the lower Brinells and semi-steels where positive angles are quite effective. But for reasonable cutter life, negative angles both rake and helix seem to be necessary to the success of this procedure in the milling of steel and its alloys. Cutting pressures with a negative angle are applied to the tip away from the cutting edge an amount approximately equal to the chip thickness.

This technique is characterized by the use of relatively high surface foot rates. Friction and abrasion are carbide's worst enemies; the use of peripheral speeds that range from 500 to 1000 fpm apparently lessens the abrasive effect of the carbide tip while in the work. There are indications that the lower surface foot rates (in the neighborhood of 400 to 500) are advisable for heat-treated steels that Brinell in the neighborhood of 375 to 425. Untreated steels, both carbon and alloy, are being milled successfully at surface foot rates as high as 800 to 1000 fpm. Where it is necessary to obtain a high finish (in the neighborhood of 15 to 20 micro inches) a high surface foot rate and a relatively low chip load are necessary.

Results of experimental work indicate definite advantages of high chip loads. The thicker the chip the farther from the cutting edge will the cutting forces be applied. This assists in preventing the breakdown of this cutting edge, thus increasing the cutter life. A high chip load is also closely connected with a higher cubic inch of metal per horsepower removal.

Carbide-Tipped Cutters

By Dr. H. A. Frommelt
Director of Research,
Kearney & Trecker Corp.

Important data on this growing metal cutting technique are presented here by authorities in that field. This article, based on the symposium held at the 1944 Westinghouse Machine Tool Forum, comprises abstracts of the paper given by Dr. H. A. Frommelt and of four prepared discussions.

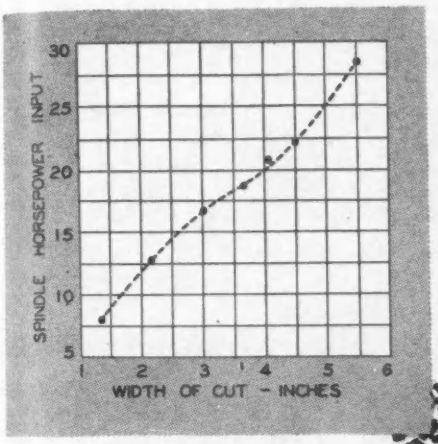


Fig. 3—Relationship between width of cut and spindle horsepower input.

2408 simplex—20 hp. sp. motor

CUTTER DATA:
8" diameter—12 teeth
Solid carbide inserts
Speed—205 rpm
Surface feet—429
Feed: 36.75 ipm
Chip load per tooth: 0.0149
Depth of cut: 0.150

There follows from the characteristics already referred to, the use of relatively high feeds. Since the feed rate is dependent on the three factors of chip load, number of teeth and revolutions per minute, the use of high peripheral speeds and high chip loads will result in a high rate at which the work-piece is being fed into the cutter. These feed rates will vary in different applications and will depend, among other things, upon the amount of power available.

Horsepower consumed in carbide milling of steel is relatively high. Experimental and research work show the increase of cutting forces necessary to remove metal with negative angles amounting to as much as 15 per cent to 20 per cent. Reference here in discussing high horsepower consumption is made, however, with regard to the *rate* of applying these cutting forces. Since the peripheral speeds are five to ten times higher than those commonly employed with high speed steel cutters, the rate of applying these cutting forces and the horsepower consumption are increased proportionately. Fig. 1 shows that in the relationship between spindle horsepower and feed rate, the curve is approximately a straight line, although the horsepower does not increase proportionately at the same rate as the feed rate.

The result of tests showing the relationship between horsepower and depth of cut (Fig. 2) also indicates a straight line relationship. Since the slope is greater than one, the increase in horsepower is proportionately less than the increase in the depth of the cut.

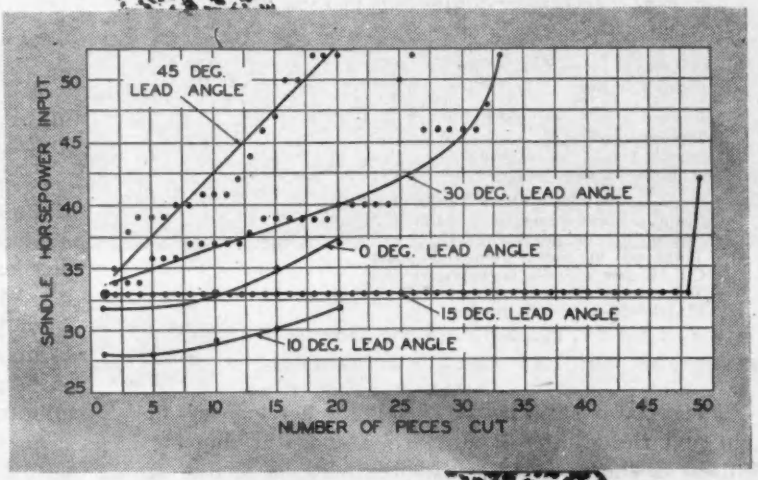


Fig. 4—Cutter life tests showing the number of workpieces cut and the spindle horsepower input using various lead angles.

Size of cut 12 in. x 3¼ in. x 0.200
Material—S.A.E. 4640—210 BHN
Diameter cutter—5 in. with 8 teeth
Feed rate—35 ipm
Speed—489 rpm

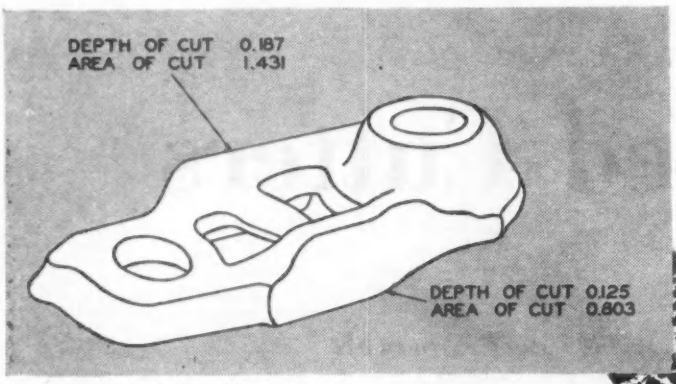


Fig 5 (Left)—Face milling tractor links.

Material—Annealed Forging Hardness—185 bhn
Machine—Special Duplex Spindle motor—7.5 hp
Speed—200 rpm Surface feet—418
Feed—.31 ipm Chip load—.0129

CUTTER DATA

Dimensions—8 in. diam.
No. of teeth—12
Angles—7 deg. N.R.—7 deg. N.H.—15 deg. Lead

OPERATION RESULTS

Spindle horsepower input—12
No. of passes per grind—125
Total cu. in. metal removed—663
Cu. in. per spindle horsepower—1.43
Tolerances—Plus or minus .0005 in.
Finish—Superior to H.S.S. Cutters

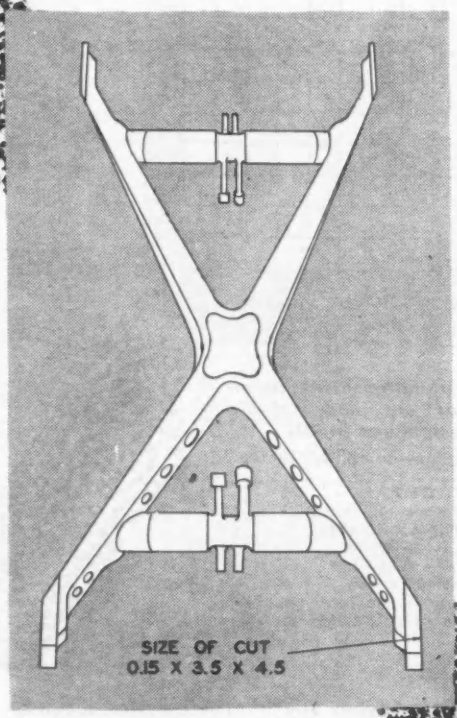


Fig. 6 (Right)—Milling Douglas C strut pads.

Material—NE 8739
Machine—Special Duplex
Speed—264 rpm
Feed—13 ipm
Hardness—360-400 BHN
Spindle Motor—15 hp driving spindles
Surface feet—552
Chip Load—.0049

CUTTER DATA

Dimensions—8 in. No. of teeth —10
Angles—7 deg. N.R.—7 deg. N.H.—15 deg. Lead

OPERATION RESULTS

Spindle horsepower input—8.5 hp. per spindle
No. of passes per grind—22
Total cu. in. metal removed—52.0 per spindle
Cu. in. per spindle horsepower—.083
Tolerances—Plus or minus .0005 in.
Finish—20-30 micro inches

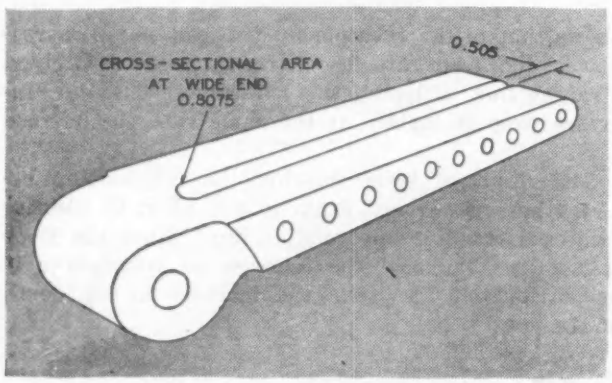


Fig. 7 (Above)—Milling slot in wing hinge.

Material—SAE 4340 Hardness—402 BHN
Machine—Simplex Spindle motor—15 hp
Speed—264 rpm Surface feet—552
Feed—13 ipm Chip load—.0041

CUTTER DATA

Dimensions—8 in. diameter
No. of teeth—12 effective
Angles—15 deg. N.R.—0 deg. helix

OPERATION RESULTS

Spindle horsepower input—18.5
No. of passes per grind—35
Total cu. in. metal removed—183.4
Cu. in. per spindle horsepower—5.7
Tolerances—Plus or minus .0005
Finish—20-30 micro inches

The relationship between spindle horsepower input and the width of cut with a constant diameter cutter as shown in Fig. 3 approximates a double reverse S-type curve. The rate of increase in power is less from 3.0 in. to 5.0 in. than it is from 1½ in. to 3.0 in. Two factors play an important part in this relationship. The entrance angle with the smaller work-piece is decidedly positive as compared with a true negative entrance angle with a 5.0 in. work-piece. The wider work-piece involves a longer arc of carbide cutting tip contact, hence relatively greater power consumption.

The series of curves in Fig. 4 indicates the increase in horsepower with an increasing number of passes. The most striking characteristic of these curves is the fact that there is no increase in horsepower with a 15 deg lead angle until just prior to the breakdown of the tip; the horsepower then increases from 33 to 42.

Since the feed rate depends upon the three factors of chip load, number of teeth and surface feet per minute, the current practice limits the number of teeth employed in milling cutters. This pitch varies in different localities and among designers, but a "rule-of-thumb" that seems to strike an average of current practice throughout the country can be expressed by the diameter in inches plus two. Thus, a 4.0 in. cutter will have six teeth, a 6.0 in. cutter eight teeth, etc. The fundamental reason for employing coarse pitch cutters is the necessity for restricting horsepower consumption to within reasonable limits.

There seems to be a further necessity for using fewer teeth in certain applications where a large chip accommodation space is necessary, due to the width of the cut or the length of time the carbide tip is in contact with the work-piece.

The relationship between cutter diameter and face width of work-piece is important; this relationship should be in the ratio of approximately eight to five. A larger ratio results in a disastrous entrance angle, which lessens cutter life; a smaller ratio results in lessened cutter life due to prolonged contact of carbide tip with work-piece. There are definite indications that a carbide-tipped face mill cannot be used in a confined cut where the arc of contact between the tip and the work-piece is 180 deg.

Without exception, solid wedged type cutters show from 100 per cent to 300 per cent increase in total cubic inches of metal removed per grind. Results of laboratory tests tend to indicate a reduction of 60 per cent in carbide strength for brazed cutters. If brazed tips are used, cold treatment is helpful in relieving brazing strains as shown by an appreciable increase in cutter life when brazed carbide-tipped cutters are subjected to a cold treatment of 120 F below zero for two hours.

Because of the coarse pitch cutters, flywheel effect seems essential. Attempts made to build such effect in cutter bodies is not considered either good design or effective in the elimination of undesirable impact loads. To eliminate these undesirable effects, resulting from large cutting forces and coarse pitch cutters, a flywheel should be installed or preferably built into the machine. There are definite indications that flywheel effect is necessary in some categories of carbide steel milling to increase cutter life and also to eliminate excessive depreciation of equipment.

Typical illustrations of carbide steel milling operations are shown in Figs. 5, 6, 7. Milling tractor links (Fig. 5) was performed on a Special Duplex Milling Machine, spindles of which are powered by a 7.5 hp motor. Conversion from high speed to carbide face mills resulted in some interesting data. The feed rate was increased from 11 ipm to 31 ipm; the rpm from 57 to 200. These 8.0 in. cutters have wedged solid carbide blanks instead of brazed tips. The increase in number of cubic inches removed with this type of cutter is 663 as compared with 365 for the brazed tip milling cutter operated under the identical conditions.

The size of the cut in milling the pads on the aircraft landing strut (Fig. 6) is .150 in. by 3½ in. by 4½ in. These pads are heat treated to Brinell at approximately 400. The feed rate is 13 ipm, which is equivalent of a .005 in. chip load and the peripheral speed is 552. The 8.0 in. diameter face mills have 10 teeth, whose angles are 7.0 deg negative helix. The lead angle on these cutters is 15 deg which gives apparently the best cutter life. The finish resulting from this operation is as good as 20 micro inches, which is considerably better than that obtained with high speed cutters.

Fig. 7 illustrates milling of slot in a wing hinge. This is an interrupted cut, which is detrimental to the life of the carbide tips. This SAE 4340 material is heat-treated to Brinell at approximately 420. The conversion from high speed cutters to carbide-tipped cutters resulted in an increase of the feed rate from one-half ipm to 13 ipm. The spindle speed was stepped up from 25 to 264 rpm. This 8.0 in. diameter cutter has angle tips of zero deg helix and 15 deg negative rake. Perhaps the most outstanding feature of this operation, which is a regular production run, is the increases in cutter life from 11 inches per grind to 35. In addition, the tolerances are much closer—for parallelism .0002 in. is maintained; for width .0005 in. is maintained. The finish with carbide-tipped cutters is far superior to that of high speed; a 20 to 30 micro inch finish is a conservative estimate.

Calculating Number of Teeth in Cutters

By H. L. Pope, Engineering Service Department, Cincinnati Milling & Grinding Machines, Inc.

FROM time to time an effort has been made to set up some given rule whereby a quick calculation of the number of teeth in a cutter can be established. The "rule of thumb" suggested in the paper that the number of teeth in the cutter represent the diameter of the cutter in inches plus two is a little too elementary and apt to lead to disastrous and very disappointing results. The suggestion is made, therefore, that we might profitably calculate the number of teeth which should be provided in the cutter by a determination of the horsepower available on the machine which is to perform the milling operation, the feed per tooth which is most desired for the material to be cut, the peripheral cutting speeds which are most desired for the material to be cut, the depth of cut, the width of cut and finally by the cutting qualities of the material as determined by the horsepower required to remove a cubic inch of this material per minute. With these factors a very simple equation can be arrived at and expressed as follows:

$$\text{Number of teeth} = \frac{HP}{KDFWN}$$

HP = Horsepower of machine.
K = Horsepower required to remove a cubic inch of material per minute.
D = Depth of cut.
F = Feed per tooth in inches.
W = Width of cut in inches.
N = RPM of cutter.

In the equation it is essential that some effort be made to determine the value of factor K in advance. This can very easily be done by making an initial test cut which is known to be safe for the power which is available in the machine upon which the job is to be milled and using this value in the formula given here. In general, for very mild steels factor K may have a value of one, whereas in some of the tougher alloy steels its value may be as high as 1.4. These values are for cutters which are in good operating condition and some allowance should preferably be made for the possibility of greater power being required under conditions which prevail when the cutter becomes somewhat dull.

Tungsten-Titanium Carbide Hardness

By P. M. McKenna, President, Kennametal, Inc.

ALL of the examples reported by Dr. Frommelt were done with compositions containing tungsten, titanium, carbide, corresponding to the chemical formula $WTiC_2$. This compound was synthesized first in 1937, when we heated titanium oxide, tungsten, carbon and nickel to about 4300 F., al-

(*Turn to page 92, please*)

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Airbriefs

By Henry Lowe Brownback

These Rotating Wings

We have often pointed out that the most certain way to kill anything is to praise it so highly that the public thinks it a marvel and a cure-all and then have it perform like any new engineering enterprise. The autogyro was reduced to the point where it was kept alive only because of the willingness of a wealthy enthusiast to feed the enterprise money in large chunks and largely because the machine was first hailed as everyman's opportunity to fly. The machine invented and perfected by a man who had "never been able to fly a conventional airplane and had found this sure and safe method of getting off of the ground."

When most pilots flew the Gyro they found that it required a special skill and that it had certain characteristics which caused crack-ups in the hands of skilled pilots who tried to handle it like a conventional machine. The Gyro has many wonderful qualities and its cousin, the Helicopter, which is only possible because the Gyro wing construction had been perfected and was adopted in the new machine, has a great future unless it is killed by exaggerated promises.

The present machines are expensive, somewhat difficult to handle and their wing construction needs a great deal of research before it is a production proposition. It is a conservative approach backed by real engineering then following up a few machines in the hands of the public until the "bugs" are eliminated which will produce results and not the grandiose promises of "production wizards" in non-aviation lines backed by large advertising appropriations and loosely made promises which will do it. As a people we have done wonders in producing machines for this war, but we have had soft spots and nearly everyone of these soft spots has been a company doing something in mass production before it had found out how to do it. We have heard much of welded ships breaking in half but these ships were not built by shipbuilders with decades of experience, but by men coming in from other lines and creating production records while finding out how to do the job. One must give them all credit for their courage and ingenuity and, perhaps, without them we would never have gotten our task done in time but, while this may help win wars, it would be fatal in the creation of a market for you and I to invest our few dollars.

Glues

We have from time to time told about new adhesives and their qualities—sometimes their weaknesses. The phenol base glues have been superior to the urea-resins as they have been more nearly waterproof, easier to handle and less liable to crazing after a period of time. They had the disadvantage of needing heat to set them. I have just seen a wooden structure made with a new phenol-formaldyhide resin adhesive which is most interesting in that it sets and cures at room temperature. This requires a new technique to keep the glue from hardening in the pot quickly. The mixture is kept at a low temperature in an ice bath and it will not set up for about two hours at room temperature after application to the wood. After setting it seems to have all of the qualities of the heat setting glues. This comparatively long assembly time will permit the design of many plastic "glued" structures which were heretofore impractical.

Hulls

Several sizes of boat hulls have been built for the Army and Navy on an entirely new design which throws no spray and yet handles exactly like a normal boat. It is a patented design worked out in the past three years and should have applications in seaplane work as its design should make it very "soft" on landings and its ability to run without throwing any spray at all will be most valuable.

Small Engines

The little engines developed for use in auxiliary work in aircraft should find a large market in the postwar world. It is strange how long it has taken to develop light power and how long the old heavy cast iron engine has hung on. Years ago a marine engine was a massive chunk of iron which took up most of the desirable space in a boat and now with high speed engines and gearing it is a light smooth running machine which can be installed in most any corner.

Plastics

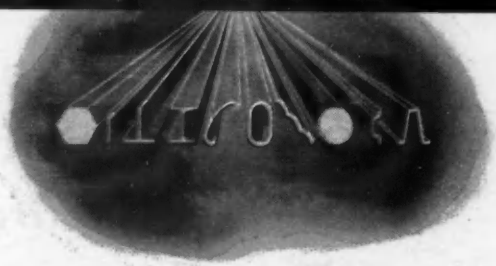
Lightweight cloth-base plastics have been used at many points in aircraft, but some forms have been subject to local tensile failures. This is being overcome by the inclusion of metal at the failure points, the plastic bonding the metal to the cloth. Certainly combinations of wood, metal and cloth, spun glass, etc., with plastics, each material in the whole being used most advantageously, have a tremendous future.

Very thin seaplane planking may be made of wood and metal bonded together to take advantage of the strength and worm-proof characteristics of the metal with the light wood giving it the backing necessary for stiffness or wood-cloth combinations may be made and whole seamless sections molded and assembled on multi-material framework by plastic adhesives. Truly, the surface has only been scratched as far as this construction has gone. The Army outboard "Stormboat" and the new "IVB" hollow-bow airplane propeller driven aircraft rescue boats can be beached at full speed fully loaded on ¼ in. plywood bottoms with no damage, thanks to proper design.

Gasoline

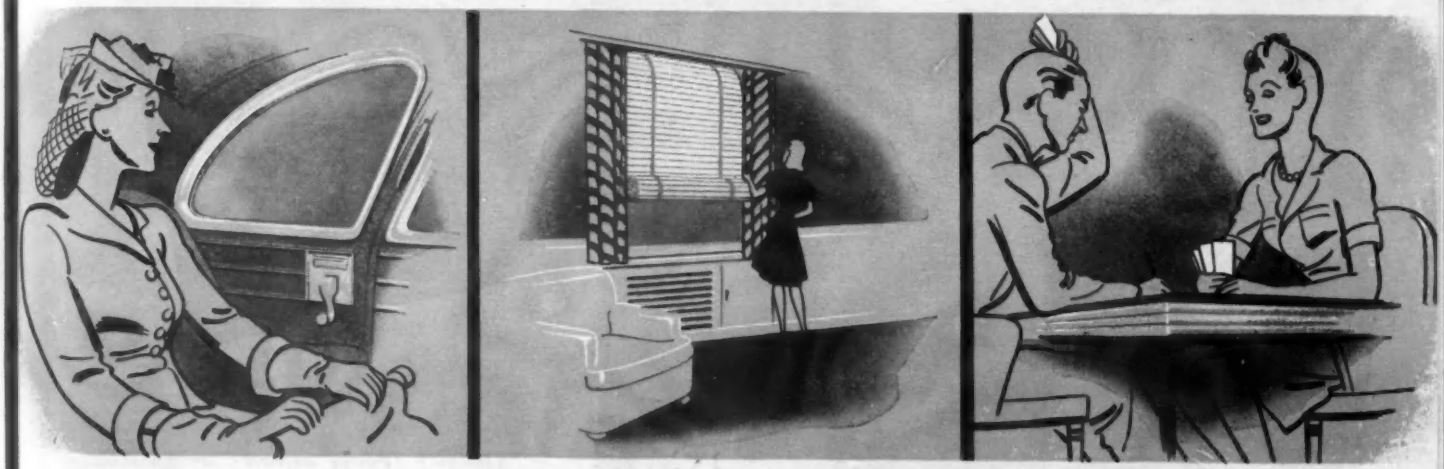
In the last issue of *Airbriefs* we prodded the engine builders a little about the inability of small engines to use premium motor fuel. I have had several replies and one of them coming from a man prominent in the engine business is so full of common sense and fits in so well with my experience as an engine builder that I am going to quote from it. He said:

"I thoroughly concur with you, from a sales and service viewpoint, that after the war we should build engines that will run on premium motor fuel and do a satisfactory job too. I realize that the CAA has a lot of arguments about high vapor pressure in automotive fuels, etc. The automobile manufacturer found a way of overcoming vapor lock by improving the fuel system installations and there is no reason why the aircraft manufacturer can't buckle down and design a fuel system for the aircraft engine which will permit the use of premium automotive fuel under all operating conditions. I hope that you will notice that I also dragged the aircraft manufacturer in on this discussion. In the final analysis, he has a certain responsibility in connection with the engine inasmuch as he insists on making the installation suit his airplane and most frequently disregards the requirements of the power plant!"



Does Ethocel Have What You Need for Extruded Trim?

Because it is made of Dow Ethylcellulose, Ethocel is inherently tough. This, plus its decorativeness, makes it exceptionally well-suited for trim and similar products



Trim has two functions—to protect and to decorate. Ethocel is particularly well adapted to fulfill both of these requirements.

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From a decorative standpoint, Ethocel is equally attractive. Color possibilities are almost unlimited and high gloss or matte finish can be obtained. Out-of-the-ordinary shapes are readily maintained.

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For further details on the advantages of using Ethocel for trim materials, write to Dow.

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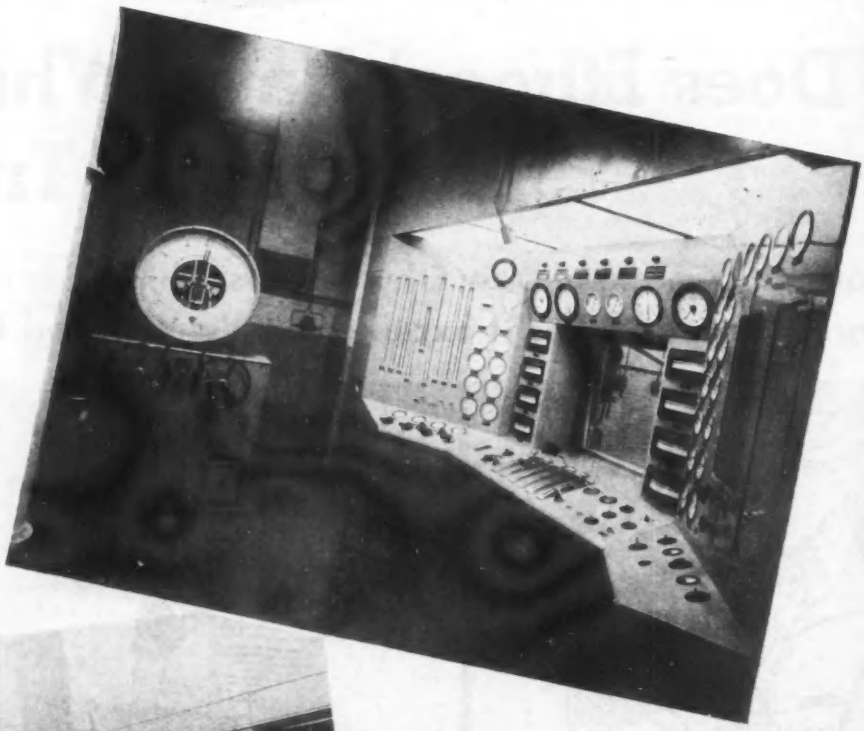
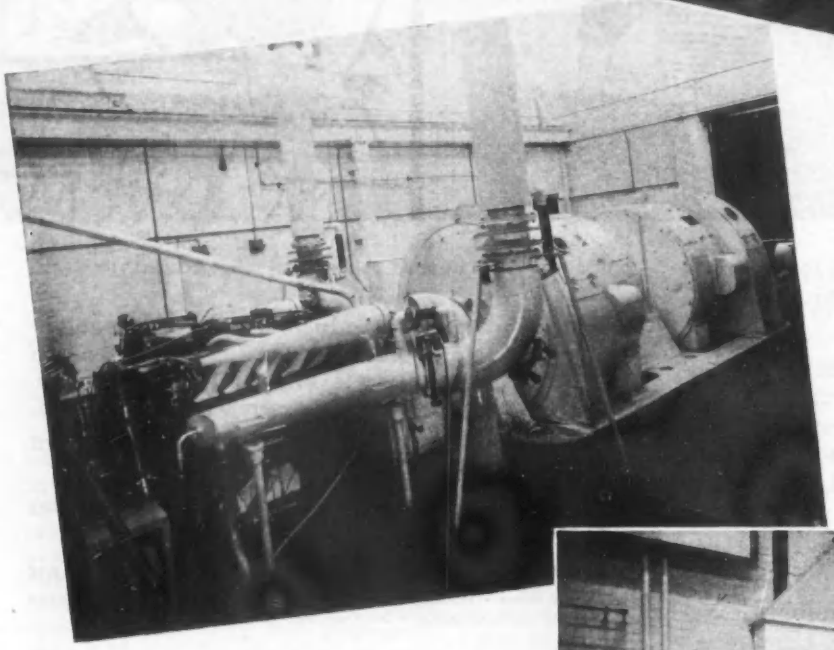
CHEMICALS INDISPENSABLE TO INDUSTRY AND VICTORY

Power Recovery System

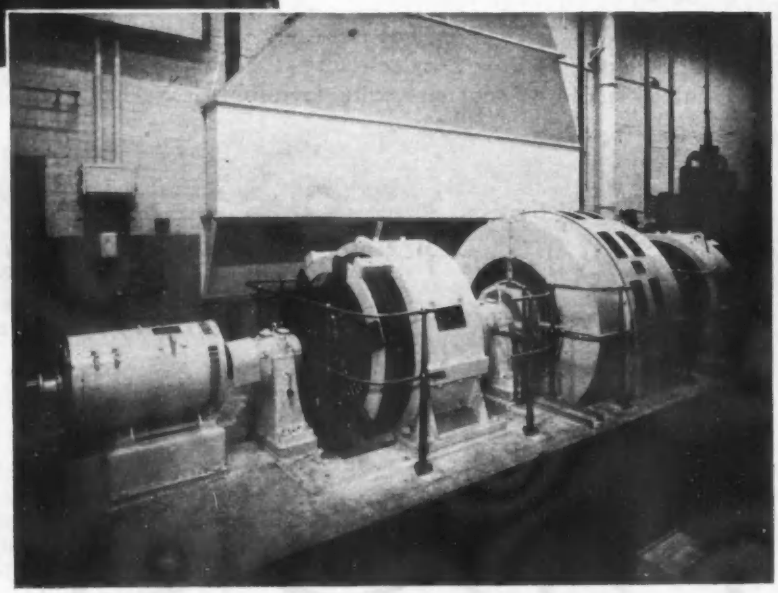
at Napier Aircraft Engine Plant



Torque scale (left) and control desk for the regenerative dynamometer system at the Napier factory.



(Below) Power recovery dynamometer equipment developed by The English Electric Co., Ltd., for testing aircraft engines at the Napier plant in England uses the well-known Ward-Leonard system. This photo shows a motor-generator set consisting of a synchronous alternating current machine and two direct current machines, each of which is coupled electrically to one unit of the dynamometer.



(Above) A 24-cylinder Sabre engine of 2200 hp on the test stand and coupled to a regenerative dynamometer set incorporating the Ward-Leonard system. This equipment is designed for testing engines fitted with reduction gears for counter-rotating propellers. For coupling to the two concentric shafts, the dynamometer comprises two units—an inner unit adjacent to the engine with a hollow shaft in which is the second shaft that is coupled to the solid shaft of the outer dynamometer. The two armatures of the dynamometer revolve in opposite directions. Provision is made for changing over to test engines with single propeller reduction gears.

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War Production Will Increase Until Germany Is Defeated

Shortages Exist in Many Types of War Material
Heavy Truck Program Still Lags Behind Schedule

Despite current convictions in many quarters that the war is all but over in Europe, WPB announces that war production is still on the increase and will continue so until Germany is beaten. During June new contracts for war materials in the area served by the Detroit regional WPB numbered twice as many as the number of contracts canceled, with 153 new supply orders, including renewals, totaling $508 million, against terminations or contract changes amounting to $228 million. In addition, contracts for 271 facilities costing $7 million were approved.

The Chicago Ordnance District has disclosed that new contracts approved in that area in June hit the highest level since March, 1942, with a total of more than $496 million, against terminations of only slightly more than $5 million.

Lieut.-Gen. Brehon B. Sommervell, commander of the Army Service Forces, also pointed up the need for increased production when he reported on Aug. 1 that shortages exist in 320 categories of war material and that in 90 of them supplies on hand constitute less than 50 per cent of minimum requirements. He pointed out that production for the Army Service Forces has declined from a high point of $2,122,000,000 in November, 1943, to $1,852,000,000 in June of this year, whereas military needs have been increased by expanding military operations. He laid the production shortage to lack of manpower principally, with shortage of facilities also responsible in some cases. The raw material situation is generally satisfactory, he said.

The heavy duty truck program continues to be one of the most thorny problems, with production during the second quarter of this year 22 per cent behind schedule. Chief difficulty is centered around the shortage of forgings and castings, which is attributed to lack of manpower in foundries. The trouble is compounded by low wages prevailing in the industry, hot working conditions, especially during the summer months, and lack of skilled foremen to supervise the work. With the industry operating at only 50 to 60 per cent of capacity and with rejections running as high as 50 per cent in certain cases because of inferior machining qualities, war agencies have been working overtime to find some means of attracting capable labor to foundries and forge shops. Higher wages, which apparently is the only answer, is a stumbling block because any general wage increase would require repricing the product, a job which OPA says it cannot handle because of its own manpower shortage. WPB at a recent panel meeting in Detroit reported that the labor priority referral plan should solve the difficulty in six months. However, the urgency of demands for military trucks, caused by extensive damage of rail facilities in Normandy by Allied bombers, calls for action now, military men say, pointing out that twice as many trucks must be built during the next six months if military operations are not to be hampered. Incentive pay apparently offers the most promise for immediate relief, with one survey showing a gain of 42 per cent in production in 20 plants. WPB also has urged that women be employed wherever possible, although size of castings to be handled is a limiting factor in this program.

The automotive industry, which has been the backbone of the arms program, again has been called on to supply urgently needed material in a hurry. The heavy shell program, once drastically reduced, now is again at full tilt because of the prodigious amount of large ammunition being consumed by heavy artillery at the battle front.

Chevrolet Div. of General Motors has received a $17 million contract to make 105 mm howitzer shells in five buildings of the St. Louis, Mo. ordnance plant. The company will put $12 million into machinery and equipment, for which it will later be reimbursed by the Ordnance District. In addition, Ordnance will build a new forge plant and make alterations to buildings at a cost of $5 million. The long-range nature of the program, which contemplates start of production in December and attainment of peak output of $3.5 million monthly in June, 1945, indicates how military leaders are planning to press

(*Turn to page* 102, *please*)

Revision of "Little Steel Formula" Would Affect Economy of Entire Country

Possibility of Steel Mill Wage Scales Being Made a Political Shuttlecock Causing Uneasiness

By W. C. Hirsch

Overshadowing in its potential effect on the steel price set-up, the possibility of a pre-election revision of the "Little Steel" formula looms perhaps as the cause of deepest all-around concern. Steel consumers, no less than steel producers, well recognize that such a move by the War Labor Board would affect the country's economy as a whole, but that doesn't lessen enxiety over the difficulties which the steel market would have to face in such an eventuality. Those who think in terms of the national economy are concerned about holding the price level stable generally, but the steel industry feels that it has not merely contributed more than its share to the holding of the line, but that, regardless of sacrifices, its wartime price policies have contributed immeasurably to smoothing the road for easy transition to normalcy. So it is little wonder that the very thought of steel mill wage scales and, as a now hardly escapable consequence, of steel prices being made a shuttlecock in the quadrennial tournament of politics causes considerable uneasiness in the minds of many.

According to an American Iron & Steel Institute compilation, only 12 per cent of the steel produced in the first half of 1944 was alloy steel, compared with 16½ per cent a year ago. This denotes a sharp decrease in the armed forces needs of high grade specialty steels and an increase in the tonnages of plain carbon steel required for the war. OPA has announced a new schedule of resale prices for NE 8600 and 8700 and AISI 4100 and AISI 3100. The changes were all minor in character and, according to OPA, "will result in no increases in the general price level." Shell steel demand in now expected to require around 370,000 tons of carbon steel a month and is making necessary curtailment of production of some not so urgently needed descriptions. Sheet mill capacity is being hard pressed by

(*Turn to page* 102, *please*)

How Good Is Your Score On These Questions?

Test your knowledge of tool steel selection and heat treating

The questions listed below come up frequently in every tool room. The right answer makes possible longer tool life, fewer shut downs for re-grinding and greater safety in hardening. The wrong answer costs money through short tool life, production shut downs and greater tool costs.

See if you can select the right answers. Pick the correct one (A, B or C) and check your answers against the list printed in the box at the bottom of the page.

1 —**You should use a *tough-timbre* water-hardening high carbon tool steel**

- ☐ A—For dies with intricate shapes and thin sections
- ☐ B—For a wider margin of safety in hardening
- ☐ C—For tools that require red-hard properties

2 —**When straight carbon tool steel is not tough enough for a job requiring maximum hardness**

- ☐ A—You draw it below C-60/61 Rockwell
- ☐ B—You go to a high speed steel
- ☐ C—You use a .50% carbon silicon-molybdenum water-hardening steel (Carpenter Solar)

3 —**The most useful characteristic of an oil-hardening tool steel is**

- ☐ A—It hardens with a hard case and a tough core
- ☐ B—Safety in hardening and freedom from size change
- ☐ C—Furnace atmosphere does not affect surface hardness

4 —**To increase the toughness of high speed cutting tools**

- ☐ A—Draw at 900°F. for 8 hours
- ☐ B—Quenching in oil instead of cooling in air
- ☐ C—Draw at 1050°/1100° F. for two hours

5 —**The ability to produce a fine grained case and tough core over a wide range of hardening temperatures is an indication of**

- ☐ A—The analysis of the steel
- ☐ B—A low drawing temperature
- ☐ C—Tough-timbre quality tool steel

6 —**Hot acid disc inspected tool steel is insurance against**

- ☐ A—Freedom from decarburization in heat treatment
- ☐ B—Minimum of internal defects
- ☐ C—Excessive size change in hardening

7 —**In order to get maximum wear resistance in a water-hardening tool steel you use**

- ☐ A—A high carbon-tungsten steel (Carpenter K-W)
- ☐ B—You heat treat from a lower hardening temperature
- ☐ C—You quench with fresh water

8 —**To help prevent cracking or splitting of hot forging tools**

- ☐ A—Use a lower forging temperature
- ☐ B—Water cool the dies during operation
- ☐ C—Always preheat tools before putting in service

Did you score 100%? Getting the right answers to your tool steel problems is considerably easier when you use the Carpenter Matched Set Method. In addition to simplifying the selection of the right steel for any type of tool—complete and detailed heat treating instructions are supplied by Carpenter to assure best results. Full information to answer these and other tool steel questions is given in the Carpenter Matched Tool Steel Manual. (Free to tool steel users in the U. S. A.) A request on your company letterhead stating position or title will start your copy on its way.

CORRECT ANSWERS	
1.	B
2.	C
3.	B
4.	A
5.	C
6.	B
7.	A
8.	C

Carpenter MATCHED TOOL STEELS

The Carpenter Steel Co., 103 W. Bern St., Reading, Pa.

Fisher Brothers Retire From General Motors

After a relationship that endured for a quarter of a century, the famous Fisher brothers of automobile body building industry have severed relations with General Motors Corp.

Alfred P. Sloan, Jr., G.M. board chairman, announced the separation Aug. 2 in a formal announcement. He stated that it was with great regret that he announced the retirement from active service of the four Fisher brothers: William A., vice president and director of G.M. and president of the Fisher Body Div.; Edward F., vice president and director of G.M. and general manager of Fisher Body Div.; Alfred J., director of aircraft activities for Fisher Body Div., and Lawrence P., G.M. vice president in charge of the Body Group.

In a statement to the press, the Fisher brothers stated that the break with G.M. was prompted entirely by the common desire to get together again with the fifth brother, Charles, in their own independent business. They declined to comment on the nature of the new enterprise, other than to say that they plan to go into something big where they can render a service to the nation, but that they have no definite plans at present. They stated that the new business would be located in Detroit and would carry the Fisher name.

Scotching rumors that the move may have been due to politics or friction between the brothers and G.M., the Fishers emphasized that the most cordial relations always have and still do prevail between the family and the Corporation and that they are still large stockholders and will continue to support the company policies as they have in the past.

Two of the brothers, Edward and Alfred, will continue to serve with the Fisher Body Div., as long as their efforts are needed in relation to the war effort, and Lawrence and Edward will continue in their positions as members of the board of directors, although giving up their executive positions.

When asked if the move was made suddenly, the brothers stated that they first considered the idea back in 1937 but that labor difficulties and the impending war made it unadvisable at that time. They stated further that with the advent of reconversion, now is the time to effect a separation so as to give the Corporation a free hand in setting important new policies.

The relationship began back in 1919 when G.M. bought a controlling interest in Fisher Body Corp., and later was cemented in 1926 when G.M. took full control and made Fisher Body a division. The reported price was $208 million. The Fisher Body name remains in G.M.'s possession.

Coincident with the announcement of the retirement of the Fishers, C. E. Wilson, G.M. president, revealed that Thomas P. Archer, vice president in charge of the manufacturing staff, will succeed Edward Fisher as general manager of the Fisher Body Div. Archer formerly was assistant general manager of the division.

Graham-Paige Acquires Warren City Mfg. Co.

Election of Jos. W. Frazer as Chairman of the Board of Graham-Paige Motors Corp. and the acquisition of Warren City Mfg. Co., Warren, Ohio, as a wholly owned subsidiary, was announced by Raymond J. Hodgson, President of Graham-Paige.

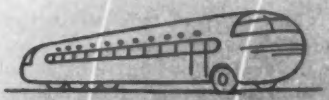
Following Frazer's election, he confirmed reports current in automotive circles that he and a group of New York associates had acquired a substantial part of the Graham-Paige stock holdings of Jos. B. Graham and the Graham family. He said the Company would undoubtedly reenter the automotive field at the end of the war as well as expand its farm machinery business.

Hodgson, Graham-Paige President for the past 3 years, continues in that capacity in the expanded organization and will also act as General Manager of both the Detroit and Warren, Ohio, operations.

REMOTE CONTROL

−65°F to +165°F

LAND–SEA–AIR



ADEL controls will save muscular effort in steering, braking, door-opening, load handling, etc., on buses, trucks and tractors.

ADEL remote controls assist with steering, engine maneuvering, clutching, braking and reversing—all with finger-tip movement of a small handle.

ADEL places power at your finger tips for operating cowl flaps, wing flaps, dive flaps, bomb bay doors, machine gun turrets, emergency exits, landing gear, etc.

ADEL systems now serve the railroad industry to operate reversing, braking, signals and other controls. Impervious to all types of weather and temperature changes.

ADEL controls lift and lower scrapers, operate tandem equipment, save strain and speed the job for busy contractors.

ADEL offers you three different types:

* *ISOdraulic (manual)*

Manual remote control. Self-contained. Operates up to 150 ft. Precise settings over temperature range of −65°F. to +160°F. with master or slave at either extreme or both. Small size and light weight. Tandem control station arrangements possible.

* *ISOdraulic (power)*

Powered remote control. Adaptable to any size hydraulic prime mover. Accurate, easy control of speed and position up to 200 ft. Flows up to 20 GPM. For airplane flaps, ship and vehicle steering, clutches, road building equipment, etc.

* *HYdraulic*

Powered remote control. Employs electronic sensing and control elements coupled with hydraulic power. Operates over great distances. Extremely versatile units adaptable to the most complex installation requirements.

*Trade Mark Registered

With ADEL remote control systems, your finger tip commands will move and accurately position loads from ounces to tons with rugged, versatile hydraulic power. Over 500,000 ADEL hydraulic units comprising 300 types and sizes now serving aircraft, armament, transportation and marine industries. Known everywhere for Design Simplicity, Standardization and DEPENDABILITY. Recent brochure available. Send us details of your problems. Let our engineers show you what ADEL can do for you.

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Plants and Engineering Service Offices: Seattle, Wash. • Detroit, Mich. • Huntington, W. Va. • Burbank, Calif. • Dayton, Ohio • Hagerstown, Md. • Baltimore, Md. • New York, N. Y.
In Canada: Railway & Power Engineering Corporation, Limited

Transportation Problems Surveyed at SAE Meeting

Comprehensive engineering discussion of wartime and post-war technical problems of land and air transportation will feature the SAE National West Coast Transportation & Maintenance Meeting, to be held August 24 and 25 at Portland, Ore. Tentative program for the meeting will be concerned with wartime maintenance of motor trucks, buses, and air cargo planes, and with fuels and lubricants used in commercial transport vehicles. The tentative program brings the post-war into focus with technical papers on future design of engines, and studies of land and air-borne transportation of passengers.

J. Verne Savage, Superintendent of Automotive Equipment, City of Portland, is general chairman of the meeting, which is sponsored by SAE Transportation & Maintenance Engineering Activity, with SAE Oregon, Northwest, Northern California, and Southern California Sections cooperating. Among the speakers will be Ellis W. Templin, of Los Angeles, Calif., SAE Vice President for Transportation & Maintenance Engineering; and J. E. Badley, of Portland, chairman of the Oregon Section.

Magnesium Production Cut to Less than Half

Under orders from WPB, the Dow Magnesium Corp. will terminate magnesium production at the large government-owned plant at Marysville, Mich. Also, operations will be suspended at the feeder plant at Ludington, Mich. Production will taper off during August and will cease by Sept. 1 at Marysville.

The order to halt production is part of a national reduction program which will curtail production at plants at Velasco, Texas; Luckey, O.; Spokane, Wash.; and Las Vegas, Nev. The national output of 20,050,000 pounds of magnesium will be shortened by 7,917,000 pounds under the order, but WPB states that the supply on hand is adequate to meet all needs. Aluminum and magnesium have recently been removed from the list of critical materials by that agency. It is understood, however, that the closed plants will be maintained in stand-by condition to be used if needed.

The Marysville plant had been producing 3,600,000 pounds of magnesium a month. Relatively high production costs, manpower shortage, a critical coal consumption problem, and transportation difficulties were given as reasons for halting operations by WPB.

Stewart-Warner Quarter Century Club Formed

More than 8,000 consecutive years of service with Stewart-Warner Corporation was represented at a recent dinner held at Chicago, where 272 of the firm's employees with 25 or more years service formed a self-governing group known as the Stewart-Warner Quarter Century Club. Diamond-studded gold pins were presented to the entire group forming the club by James S. Knowlson, president and chairman of the board of Stewart-Warner.

Continental Buys Stock Of Gray Marine Motor Co.

Continental Motors Corp. reveals that it has purchased all of the $10 par value capital stock of the Gray Marine Motor Co. of Detroit. The deal involved 20,130 shares and the reported price paid was $2,616,910. Founded 38 years ago, the company is a large supplier of marine engines for commercial fishing and freight boats and pleasure craft in peacetime. During the war it has been chiefly occupied with building engines for use in landing craft. Prior to Pearl Harbor, the company had representives distributing its product in 41 countries.

It is understood that John Mulford, president of Gray Marine Motor, will continue as president of the company, which will be operated as a Continental subsidiary. Frank O. Fersntrum, vice-president and general manager, will continue in that post.

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It may help you solve many unusual engineering problems

This new 44 page book gives you complete story of "SPRING-LIFE" BELLOWS

By engineers—for engineers—yet with information and illustrations so complete that all men engaged in manufacturing can gather a full knowledge of bellows and their functions. This catalog will be sent to you immediately upon receipt of a request on your letterhead.

This informative book tells all about "Spring-life" Bellows, including

THEIR CHARACTERISTICS—showing why they have received such a tremendous acceptance amongst engineers all over the country.

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Also included in this book are illustrations and information pertaining to Cook Pressure Detector Switches, and an introduction to the Cook "MetaLastic" Division.

Remember, if you have an extremely urgent problem, wire or 'phone us, and we shall be pleased to quickly dispatch a field engineer from one of our district offices to assist you.

COOK ELECTRIC Company

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NSPA Membership Soars to New High

The mounting membership strength of the National Standards Parts Association has just been augmented by 60 automotive after-market wholesalers and manufacturers, whose applications were acted upon at the organization's recent executive conference in Cincinnati.

Included in the new list are 52 wholesalers and 8 manufacturers representing automotive production and distribution in 28 states and the Dominion of Canada. The manufacturers and their association delegates are: Auto Parts and Supplies (S. L. Mitchell), Martinsville, Virginia; Athens Automotive Service (Glen O. Staneart), Athens, Ohio; Bailey Supply Company (Robert A. Bailey), Springfield, Illinois; Brrera's Supply Company (Miguel Olivarez), Mission, Texas; J. D. Babcock and Company (J. D. Babcock), Beaver Dam, Wisconsin; Balletine Auto Parts (John G. Ballentine), Pulaski, Tennessee; Bloxom Auto Supply (Alvah B. Bloxom), Mappsville, Virginia; Cogans Auto Supply Company (Sam Cogan), Lawrence, Mass.; Cox-Wellman, Inc., (M. C. Cox), California; Chilton Service (Fred Friedli), Nashville, Tennessee; Chappell Machinery Company (M. A. Chappell), Americus, Georgia.

Obituary

Edward Bausch, 89, chairman of the board of the Bausch & Lomb Optical Co., died July 30 in his home in Rochester, N. Y.

Dr. Frank Tone, 75, Chairman of the Board of The Carborundum Company, died July 26 at his home at Niagara Falls after a long illness.

Business in Brief

Written by the Guaranty Trust Co., New York, Exclusively for AUTOMOTIVE AND AVIATION INDUSTRIES

Little net change in the pace of general business activity is currently indicated. The seasonally adjusted index of *The New York Times* for the week ended July 22 rose 144.4, as compared with 139.2 for the preceding week and 141.5 a year ago.

Department store sales, as reported by the Federal Reserve Board, declined from 127 to 121 per cent of the 1935-39 average in the week ended July 22; but the indicated value was 11 per cent above the corresponding sum in 1943. For 1944 to date, the total is 7 per cent greater than the comparable amount last year.

Railway freight loadings during the week ended July 22 totaled 903,034 cars, 0.2 per cent less than the preceding weekly number but 2.2 per cent above the corresponding figure in 1943.

Production of electric power in the week ended July 29 increased by a smaller amount than the usual seasonal gain; and the total was 3.9 per cent above the output a year ago, as against a similar excess of 4.4 per cent reported a week earlier.

Crude oil production in the same period averaged 4,608,450 barrels daily, 7000 barrels below the all-time peak reported a week earlier but 2350 barrels more than the average output recommended by the Petroleum Administration for War.

Estimated production of soft coal during the week ended July 22 was 11,985,000 net tons, 2.2 per cent less than the preceding weekly figure. For 1944 to date, the indicated output is 8.9 per cent above the comparable amount in 1943.

Engineering construction contracts awarded during the week ended July 27 amounted to $41,066,000, exceeding by 4 per cent the previous four-week moving average, according to *Engineering News-Record*. Contracts so far reported this year show a decline of 49 per cent from the corresponding amount in 1943—the drop in public projects amounting to 55 per cent, as against a recession of 6 per cent in private construction.

The Irving Fisher index of wholesale commodity prices advanced fractionally in the week ended July 28 to 113.0 per cent of the 1926 average, as against 110.3 a year ago.

Member bank reserves increased $39,000,000 during the week ended July 26, but excess reserves declined $200,000,000 to an estimated total of $1,300,000,000. Business loans of reporting members increased $20,000,000 in the same period and stood $460,000,000 above the total a year ago.

ROTO SHAVING

Finishes

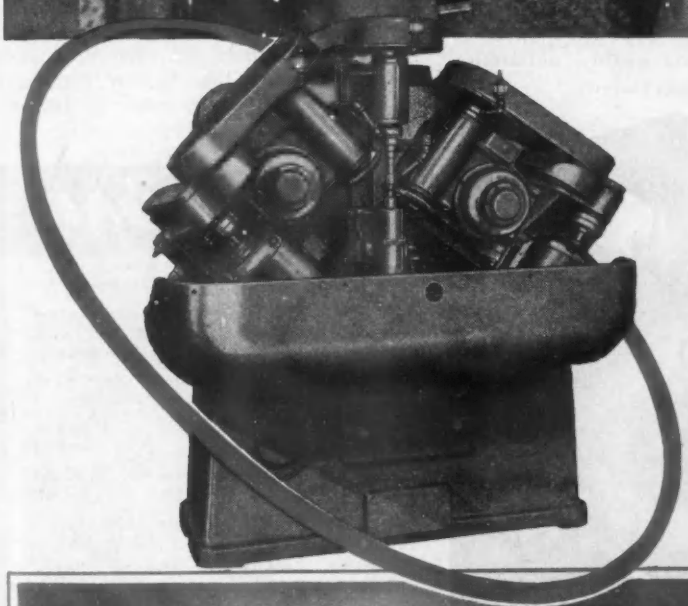
CYLINDRICAL and CONICAL SURFACES

Faster and Better

On parts having a hardness of 38 Rockwell or less, Roto Shaving is better than grinding because it is faster, more economical and the finished surfaces can be maintained to a high degree of smoothness. Production rates are about three times that of grinding.

A 100% complete inspection of a lot of 4,000 consecutive pieces reveals a maximum variation of .001" on the diameters. Stock removed ranges from .010" to .015" on the flanges and .020" on cylindrical diameters.

A special fine pitch milling cutter is used for this work and the work is rotated during the cut but at lower speeds than for grinding. These cutters wear very slowly and may be sharpened on ordinary shop equipment. The gradual wear materially reduces machine adjustments.



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Specialists on SPUR AND HELICAL INVOLUTE GEAR PRACTICE

Originators of ROTARY SHAVING AND ELLIPTOID TOOTH FORMS

Output of Trucks Must Be Increased

Although production of automotive vehicles will have to be increased approximately 42 per cent in the last six months of this year to make up the deficit of the first six months there is still hope that civilian needs for trucks will also be filled, according to statements made by Lt. Gen. Brehon Somervell, Chief of the Army Service Forces, to a news conference in early August.

One of the Army's most critical needs at the present time is to step up production of heavy trucks during the last half of the year by more than 40,000 above the number produced in the first six months of 1944. This will mean production of about 80,000 heavy trucks. General Somervell assured AUTOMOTIVE & AVIATION INDUSTRIES that the Army would continue its policy of aiding production of civilian trucks by sharing facilities and pointed out that of the 80,000 heavy trucks about 16,000 would be to fill the ODT program.

October will be the peak month in the Army's expanded production program. General Somervell said that the limiting factor in heavy truck production has been manpower and that civilian agencies were working toward a solution. The Army's need for trucks has risen because of the larger number of trucks that have been used for long periods of time and are no longer serviceable. This factor, along with the production schedules that were not met during the first half of the year require production of medium trucks to be increased 34 per cent in the last half of the year, heavy trucks, 78 per cent and all other vehicles, 13 per cent.

Bendix to Operate Third Plant at Elmira

Appointed as official operating agency for the United States Army Air Forces, the Eclipse Machine Division of Bendix Aviation Corporation will take over operation of the United States Navy — Remington-Rand "N" plant at Elmira, N. Y., to expand mass production of new equipment for the B-29 Super-Fortresses.

As soon as accountability for the structure officially passes from the navy to the Army Air Forces, the factory will be designated as "Eclipse Plant No. 3." The division operates two other Bendix-owned plants in Elmira.

New Axle Housing Plant

Retooling of the number two plant of the Barnes Drill Company, the former Rockford Iron Works factory, is now complete and the plant is prepared to turn out rear axle housing assemblies for heavy duty military trucks, according to Albert M. Johnson, president of the Barnes Drill Company.

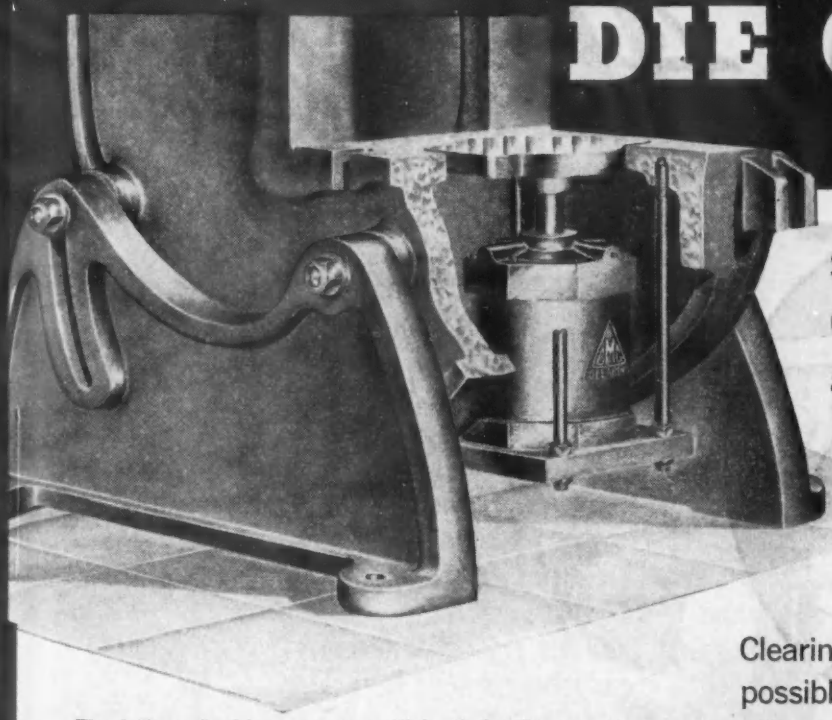
The firm has obtained a sub-contract from the Standard Steel Spring Company of Madison, Ill., for production of the rear axle housings for the heavy duty axle sets being made by the latter for the army.

CALENDAR

Conventions and Meetings

SAE Natl. West Coast Transportation & Maintenance Meeting, Portland, Oregon	August 24-25
American Chemical Society, New York City	Sept. 11-15
SAE Natl. Tractor Meeting, Milwaukee	Sept. 13-15
SAE Natl. Aircraft Eng. & Production Mtg., Los Angeles	Oct. 5-7
American Society of Tool Engineers, Syracuse, N. Y.	Oct. 12-14
American Society for Metals, Cleveland	Oct. 16-21
SAE Natl. Fuels & Lubricants Mtg., Tulsa	Nov. 9-10
Motor & Equip. Wholesalers Assn. Convention, Chicago	Nov. 9-11
American Chemical Society Natl. Chemical Exp., Chicago	Nov. 15-19
SAE Natl. Air Cargo Mtg., Chicago,	Dec. 4-6
Natl. Aviation Trades Assoc., St. Louis	Dec. 6-7-8
SAE Annual Meeting, Detroit	Jan. 8-12

CLEARING PNEUMATIC DIE CUSHIONS



Special Features of Clearing Cushions Help Eliminate Inaccuracies, Reduce Die Wear and Maintenance Costs

The L Type Cushion operates efficiently in either vertical or inclined position. It offers marked advantages in handling the kind of metal drawing jobs done on inclinable and small straight side presses. Furnished complete with pressure pad and supports made in accordance with specifications of the press to be used. Note that pressure pad fits into bed opening of the press.

The F Type Air Cushion installation shown below is a built-in type guided in the bed by long bronze wear strips to prevent tilting. This type of cushion can be equipped with locking devices for holding the pressure pad down at the bottom of the stroke as sometimes required by special dies or double action press operations.

Shown above are three Clearing F Type Air Cushions installed in the bed of a press.

Clearing Pneumatic Die Cushions make it possible for you to secure maximum operating efficiency and economy from any press. The advanced design of these cushions is the result of Clearing's practical, specialized experience in building presses and accessories of all types.

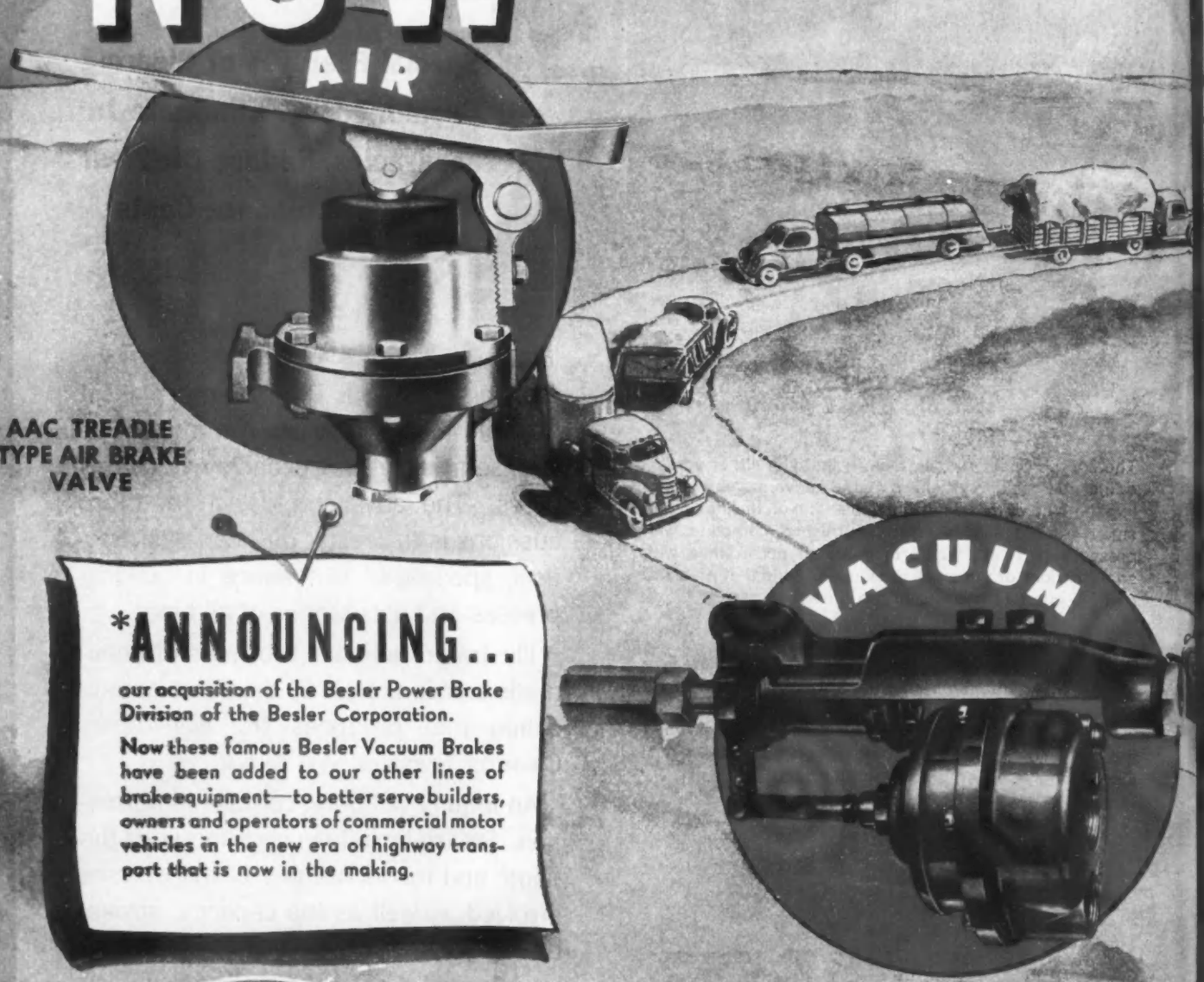
Illustrated here are two types of pneumatic cushions built by the same organization that produces the well-known Clearing Presses.

An inquiry will bring complete information. Please include in such inquiries the name and model number of the presses involved as well as the capacity, stroke, bed opening and bed area. If you prefer, we will mail a special bulletin describing the complete line of Clearing Cushions. Send for this information today. Clearing Machine Corporation, 6499 West 65th Street, Chicago 38, Illinois.

CLEARING

CMC CLEARING

NOW All Three



AAC TREADLE TYPE AIR BRAKE VALVE

*ANNOUNCING...

our acquisition of the Besler Power Brake Division of the Besler Corporation.

Now these famous Besler Vacuum Brakes have been added to our other lines of brake equipment—to better serve builders, owners and operators of commercial motor vehicles in the new era of highway transport that is now in the making.

*AAC BESLER FOOT CONTROL VALVE

AAC Products

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We are speaking of brakes... brakes for the buses, trucks, trailers and tractors of today and tomorrow. Brakes that will best fulfill your requirements, give you maximum performance, safety, dependability and economy.

Obviously, you don't want to buy air brakes if vacuum will better serve your needs—nor vacuum brakes if hydraulic provide the correct solution to your braking problems. Obviously, too, you will get better answers to your brake questions from an organization that builds all three—*Air*, *Vacuum* and *Hydraulic*.

AAC Brake Engineers are at your disposal—to consult with you on your brake needs and recommend the type of equipment which will best meet your requirements. Address inquiries to

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BURBANK, CALIFORNIA

P-84

AAC HYDRAULIC POWER BRAKE VALVE

T ACCESSORIES CORPORATION

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PERSONALS

R. L. Willis has been appointed sales engineer of the TOCCO Process Induction Heating Div. of The Ohio Crankshaft Co.

W. A. Williams has been made branch manager of the Ford Motor Company at Salt Lake City. **A. E. Klemmedson** has been named manager of the Oklahoma City branch and **F. C. Richmond,** formerly of the Dearborn office, has been made Assistant Manager of the Cleveland branch.

E. E. LeVan has been elected president of Haynes Stellite Co., Unit of Union Carbide and Carbon Corp., succeeding the late Francis P. Gormely.

William J. Priestley has been elected president of Electro Metallurgical Co., Electro Metallurgical Co. of Canada, Ltd., Michigan Northern Power Co. and Union Carbide Co. of Canada, Ltd., Units of Union Carbide and Carbon Corp.

The appointment of **James R. Longwell** as dircetor of engineering and research at Carboloy Co., Inc., has been announced. Mr. Longwell was, successively, development engineer, chief engineer and factory manager.

The Board of Directors of Superior Steel Corp. has elected **Carl I. Collins** president of the company, succeeding the late Frank R. Frost.

Stanley W. MacKenzie has been appointed director of purchases of United States Rubber Co. to succeed **George M. Tisdale,** recently elected vice-president and member of the executive committee of the company.

Edward L. Bertram resumes his prewar position with the Automatic Transportation Co., Div. of Yale and Towne Mfg. Co., as sales promotion and advertising manager, after having been on leave of absence for approximately two years as captain in the U. S. Army Ordnance Dept., office of Chief of Ordnance, Field Service Div.

The resignation of **Fred B. Lautzenhiser** as engineering consultant to the Automotive Division was announced today by the War Production Board. He will return to the International Harvester Co. as consulting engineer.

The Kaydon Engineering Corp. has announced the appointment of **J. F. Oehlhoffen,** formerly sales manager and advertising director for the Bantam Bearing Div. of the Torrington Co., as assistant to the president of Kaydon. **H. J. Miller,** formerly plant manager of the Goodyear Aircraft Corp., has been made factory manager.

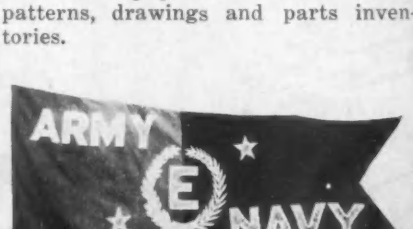
General Electric's Motor Div. has announced the following appointments: **Elliott Harrington,** manager sales of a newly formed Integral-horsepower, alternating current motor section, located in Schenectady. **J. T. Farrell,** manager sales of the newly formed Integral-horsepower direct-current motor section, Schenectady, and **D. A. Yates,** assistant manager sales of both sections in charge of Lynn motor sales group, located at Lynn River Works.

F. Malcolm Reid, vice-president in charge of engineering of the Fruehauf Trailer Co.,

(*Turn to page* 62, *please*)

Fisher Furnace Buys Rights Of Monarch Eng. & Mfg. Co.

The industrial furnace business of the Monarch Engineering and Manufacturing Company of Baltimore, Maryland, has been purchased by the Fisher Furnace Company of Chicago. The transaction gives the Fisher Furnace Co. all rights to manufacture Monarch Equipment and includes all patterns, drawings and parts inventories.



AWARDS

Names and winners of Army-Navy "E" awards in or allied with the automotive and aviation industries announced since the Aug. 1 issue of Automotive and Aviation Industries went to press:

THE AUTO COMPRESSOR COMPANY, Wilmington, Ohio.

BLISS & LAUGHLIN, INC., Buffalo, N. Y.

THE GABRIEL COMPANY, Plant No. 1, Cleveland, Ohio.

THE MONTPELIER MANUFACTURING COMPANY, Montpelier, Ohio.

NORTON COMPANY, Norton Pike Division, Littleton, N. H.

RESISTOFLEX CORPORATION, Belleville, N. J.

SKINNER PURIFIERS, INC., Detroit, Mich.

"E" Star Awards

for continued meritorius services on the production front have been awarded to the following firms:

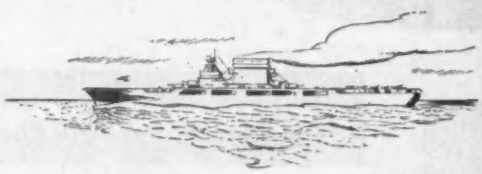
AC SPARK PLUG DIVISIN OF GENERAL MOTORS, Flint, Mich.

HAINES GAUGE COMPANY, Philadelphia, Pa.

HANDY & HARMON, Bridgeport, Conn.

In the "Queen's" kitchen stainless steel now goes 5 times as far!

Another triumph for America's know-how with metals . . .



Everywhere in the galley of that queen of the seas—the aircraft carrier—there's the gleam of stainless "clad" . . . on tables and lockers . . . around ranges and refrigerators.

What a time and work saver it is. One wipe and it's clean. Truly, the "Queen's" kitchen is demonstrating a trend that the nation will follow when the war is over.

Stainless steel is a costly and critical alloy—so American ingenuity has found a way to make it go five times as far!

The Ingersoll Division of Borg-Warner has perfected a means of wedding a thin surface of stainless steel to a much less expensive low-carbon steel base. This economical new "IngAclad" is being produced for the galleys of our aircraft carriers and for many other wartime needs.

"IngAclad" is one of a hundred products that pour from the mills and factories of Borg-Warner into the hands of our armed forces. And all give evidence that our fighters are getting the finest.

For years Borg-Warner's many units have made a vast variety of essential equipment for the farm and home and for transportation . . . products that benefit almost every American every day.

Partners with the automotive and aviation industries in peace and war, Borg-Warner supplies these and other essential parts . . .

CLUTCHES AND CLUTCH PARTS • GEARS
UNIVERSAL JOINTS AND DRIVE SHAFTS
TRANSMISSIONS • CARBURETORS • PUMPS
TIMING CHAINS • RADIATORS • AVIATION STEEL

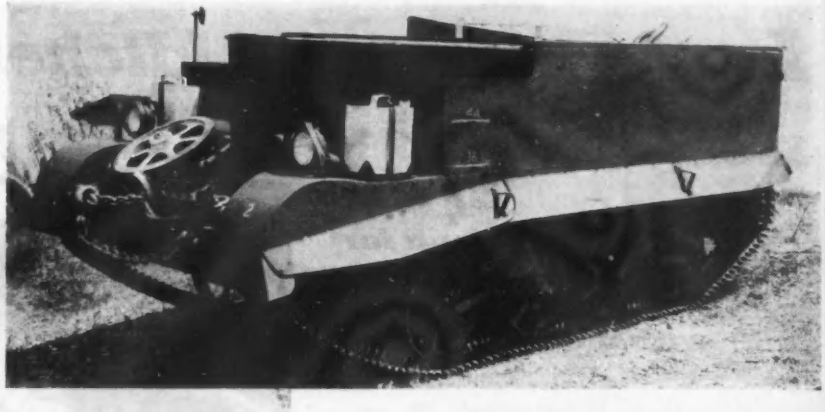
ENGINEERING B-W PRODUCTION

BORG-WARNER

Peacetime makers of essential operating parts for the automotive, aviation, marine and farm implement industries, and of Norge home appliances . . . these units which form the Borg-Warner Corporation are today devoted exclusively to the needs of war: BORG & BECK • BORG-WARNER INTERNATIONAL • BORG-WARNER SERVICE PARTS • CALUMET STEEL • DETROIT GEAR AIRCRAFT PARTS • DETROIT VAPOR STOVE • INGERSOLL STEEL & DISC • LONG • MARBON • MARVEL-SCHEBLER CARBURETER • B-W SUPERCHARGERS, INC. • MECHANICS UNIVERSAL JOINT • MORSE CHAIN • NORGE • NORGE MACHINE PRODUCTS • PESCO PRODUCTS • ROCKFORD CLUTCH • SPRING DIVISION • WARNER AUTOMOTIVE PARTS • WARNER GEAR

Universal Carrier

Production of several thousand light-armored, small-tracked military vehicles for the British government has been revealed by the Ford Motor Co. The unit is officially known as the Universal Carrier and is designed to transport infantry, machine gun and mortar crews with their weapons into combat zones. The 100-hp Ford-Mercury engine is mounted in the rear, with oil and water radiators centrally located.



PUBLICATIONS

A 4-page technical catalog, designed primarily for the product engineer, describing **Cottonleather Fabric,** a new abrasion-resistant plasticized fabric, has been published by the Southern Friction Materials Co. Cottonleather is suggested for numerous industrial applications such as covering for rollers, pulleys, safety floor covering, safety stair treads, etc.*

Catalog No. 300 issued by The Cleveland Worm & Gear Co. describes and illustrates the **Speedaire Fan Cooled Gear Reduction Units.** The principle of Speedaire is fully detailed by means of cutaway photographs, charts, diagrams and engineering tables.*

Watson-Stillman Co. has announced four new bulletins, as follows: No. 230-A covering **Direct Stem and Flush Mounted Gauges** for use on hydraulic presses and pumps where accurate, trouble-free indication of hydraulic pressures is essential; No. 650-A, describing and illustrating **hydraulic presses** for extruding and molding ceramics; No. 330-A, generally utility **Vertical-Horizontal Presses;** and A-6, a third edition of a bulletin describing improved features of **hydraulic and hand shears** for cutting commercial grade wire rope, etc.*

A 16-page booklet which emphasizes fundamental practices for the economic use of degreasing solvents in metal cleaning departments of industrial plants and describes typical designs of degreasers, has just been published by Detrex Corp. It is titled **Solvent Degreasing and Effective Methods of Conserving Chlorinated Solvents.** Detrex has also issued an 8-page booklet, **Detrex Triad Alkali Cleaners,** which describes alkali and emulsion cleaning compounds.*

du Pont Company, Finishes Div., has issued a completely new and up-to-date booklet on **Three-Dimensional Seeing, The Science of Color and Light for Better Vision in Industry.** It contains information derived from color-conditioning installatios in many plants and includes a section devoted to the Safety Color Code for Industry.*

The American Pulley Co. has issued Catalog HT-44, **American Hi-Torque Motor Pulleys,** describing composition, design and manufacturing methods, etc., of Hi-Torque pulleys. The Catalog contains also dimensions and list prices of standard sizes and complete price information for made-to-order pulleys. Another catalog has also been issued by American Pulley Co., as follows: FBD-44 **Steel Split pulleys and bushings,** shaft collars, hangers and bearings, etc., and Bulletin SJ-44 describes the new **American Speed-Jack,** and contains complete information on the unit.*

Fansteel Metallurgical Corp. has published Bulletin RDP-105, **Fansteel Selenium Rectifiers,** containing technical information, specifications, illustrations, wiring dia-

grams, catalog listings and ordering references on more than 130 standard Selenium Rectifiers.*

The Kold-Hold Mfg. Co. has issued a bulletin describing a line of **Altitude Chambers** in which manufacturers can see how products and materials will react and perform at any given altitude, temperature and degree of humidity.*

A new bulletin featuring an improved line of **Despatch Coremaster Drawer Type Ovens** has been issued by Despatch Oven Co. It tells of the advantages of this type of oven for the large and small foundry, details construction features and lists many standard models available with gas, oil and electric heating systems.*

Special information on **ground thread cutting tools and hobs** is contained in Bulletin 644 brought out by Universal Engineering Corp. It gives information on the operation of the U-6 and data on special gages, jigs and fixtures.*

A new 44-page handbook on industrial fractional horsepower **V-belt drives** has been published by The B. F. Goodrich Co. It contains a chapter on proper selection of FHP belt drives, with formulas, together with a page on how to get the most service from V-Belt drives.*

Two new catalogs by Warner & Swasey Co. are No. 4401, **Precision Tapping and Threading Machines** giving descriptions and specifications of the various models. No. 4402, describing, illustrating and giving specifications for the **No. 10 Precision Tapping and Threading Machine.***

* Obtainable by subscribers within the United States through Editorial Dept. AUTOMOTIVE *and* AVIATION INDUSTRIES. In making requests for any of these publications, be sure to give date of the issue in which the announcement appeared, your name and address, company connection and title.

PERSONALS

(*Continued from page* 60)

has been elected a director of the company.

Johns-Manville has announced the following personnel changes: **Raymond P. Townsend,** sales manager, Eastern Region, Transportation Dept., has been appointed General Sales Manager of the Transportation Dept. throughout the United States and Canada, with headquarters at New York. **John D. Johnson,** divisional sales manager of the Transportation Dept., Eastern Div., has been promoted to the position of sales manager, eastern region, with headquarters at New York.

Burd Piston Ring Co. has announced the appointment of **George H. Gruber** as sales manager of the Original Equipment Div. and **Elmer F. Eiseman** as sales manager of the replacement div.

Howard P. DeVilbiss has been elected president and general manager of The DeVilbiss Co. and **Allen D. Gutchess** has been made chairman of the board and active senior executive, according to a recent announcement.

William Balderston, formerly vice-president in charge of the commercial division, has been elected vice-president in charge of operation and a member of the executive committee of Philco Corp.

Berton M. Sharpe, project engineer for Surface Combustion, has returned from a five-month assignment in India where he supervised installation and correction of plane heating systems for the AAF.

Dr. Walter M. Mitchell has been made director of research for Mack Trucks, Inc. He will direct chemical, metallurgical, electrical, mechanical, Diesel, fuels, lubricants and other research activities allied to the company's products.

George R. Pizarro has been made manager of Adel Precision Products Corp.'s new engineering service office in New York City.

The appointment of **Frank Lau** as director of industrial relations of Willys-Overland Motors has been announced.

Charles J. Hodge has been made director of industrial relations of Republic Aviation Corp.

Jones & Laughlin Steel Co. has transferred **D. G. Gent,** formerly district manager of sales at Dallas, Texas, to the Detroit sales office. His successor at Dallas is **D. M. Griffith,** who formerly was located at the Atlanta district sales office.

Ralph T. Seward, impartial umpire in labor disputes for the New York City milk industry for the past two years, has been named to a similar post to arbitrate labor difficulties between General Motors Corp. and the UAW-CIO. He succeeds **G. Allen Dash,** who resigned to become chairman of the Review and Appeals section of the national WLB.

William K. Swigert, veteran of the automobile industry before joining Curtiss-Wright Corp. 15 years ago, has retired as manufacturing adviser for the Propeller Div. of that company.

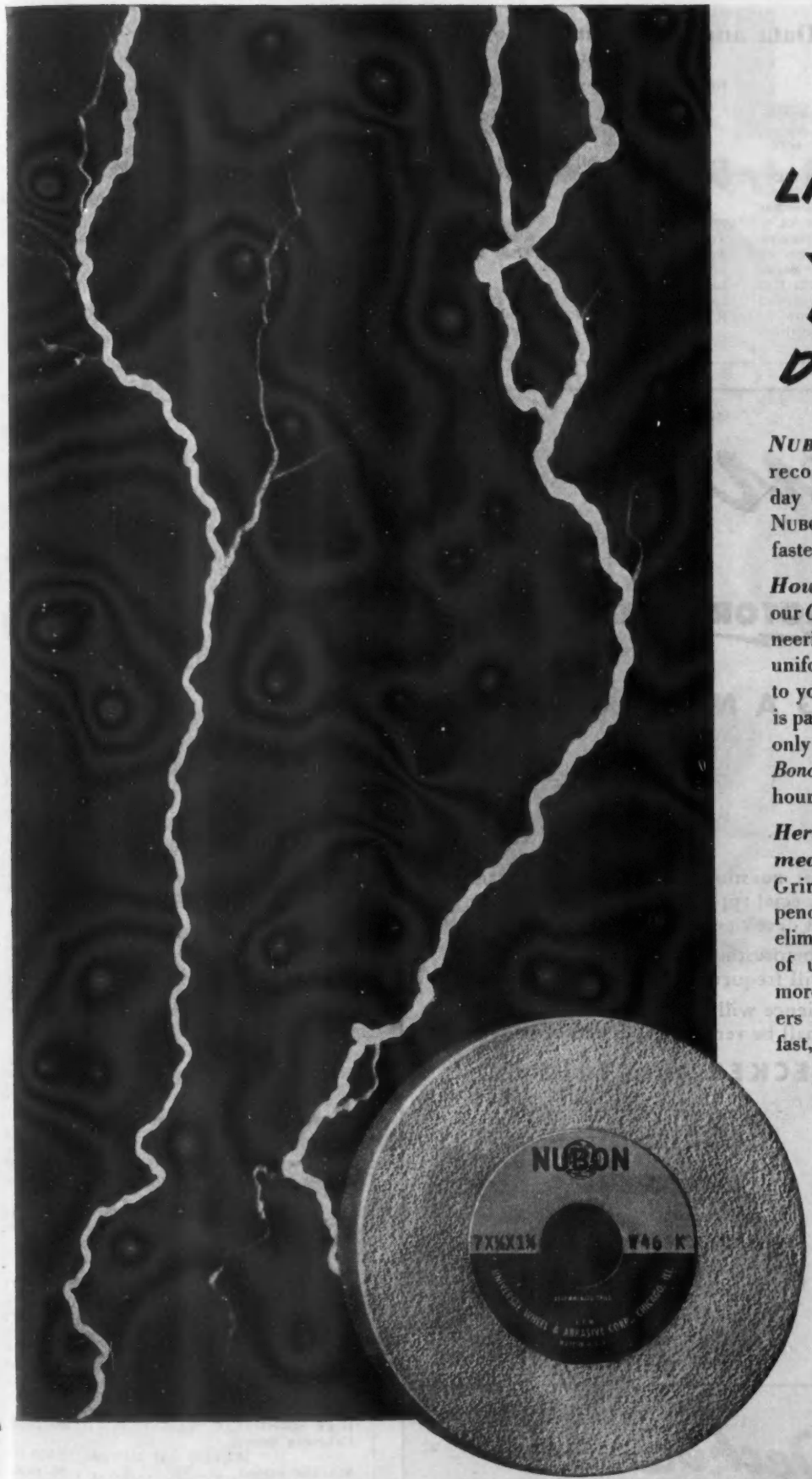
Clarence L. Wanamaker has been appointed general sales manager of the munitions division of U. S. Rubber Co.

Nash Motors has appointed **S. I. Carlson** export sales manager to head the company's wartime overseas dealer service and postwar sales program.

C. C. Lockwood, associated with Chrysler Corp. for more than 20 years, has been made advertising business manager of the Chrysler Div., reporting to George Miller, sales executive.

International Harvester Co. announces that **Forest Siefkin** has been made vice-president in charge of public relations.

L. M. Oltman, truck sales executive at Dodge Division of Chrysler Corp., has been appointed staff executive in charge of the bus and truck division of the Differential Wheel Corp.



LIGHTNING fast DELIVERY

NUBON service is smashing all records—with guaranteed 10-day delivery of precision-built NUBON Grinding Wheels—even faster service in emergencies!

How are we doing it?—By our *Controlled Trial Plan* of engineering which assures accurate, uniform Grinding Wheels built to your specifications. Our plant is part of your laboratory! That's only half the story. Our *Special Bonding Process* saves precious hours in processing time.

Here's what NUBON service means to you: CUSTOM-MADE Grinding Wheels you can depend on, when you need them; elimination of big inventories of useless wheels. No wonder more and more industrial leaders are turning to NUBON for fast, dependable service.

Send for your copy of our catalog.

UNIVERSAL WHEEL & ABRASIVE CORP.

2630 West Van Buren Street, Chicago 12, Illinois

NUBON 24 HOUR PROCESS GRINDING WHEELS AND STONES

General Data and Performance of Constellation Airplane

Mfr.—Lockheed Aircraft Corp.
Company Model—49.
Army Designation—C-69.
Type—All range, high performance passenger or cargo transport.
Construction—All metal, low wing, semi-monocoque land monoplane.
Crew and Number of Seats—Many arrangements possible, including: Air Coach—64 passengers, crew of 6, cargo; Sleeper Plane—34 berths or 48 seats, crew of 6, cargo; Club Cruiser—48 seats, lounge-bar, crew of 6, cargo; Empire Cruiser—30 reclining seats, crew of 6, cargo, game room; Paratrooper—100 soldiers with full packs and rifles; Military Personnel Transport—60 seats or 22 berths, crew of 5, relief crew of 4, cargo (now in production).

POWER PLANT—

Engines: 4 Wright Cyclone 18 cyl. aircooled radial 2200 hp. each at take-off, 8800 for 4 (note: Alternative installation of 4 Pratt & Whitney R-2800 engines is possible.).
Propellers: Hamilton Standard, 3-blade, hydromatic, quick-feathering, 15 ft. 2 in. diam.

PERFORMANCE:

Top Speed (with full load)—340 mph.
Top Cruising Speed (65% power)—Over 300 mph.
Landing Speed—80 mph.
Useful Load—Over 17 tons.
Range, Nonstop—Restricted, except "Will cross any ocean on the globe with a payload."
Service Ceiling, four engines—Over 25,000 ft.
Usable Ceiling, three engines—Over 20,000 ft.
Usable Ceiling, any two engines—Over 6700 ft.
Fuel Consumption, at "economy cruising speed" (275 mph)—One gallon of gasoline per mile.
Take-Off run (at sea level)—Less than 1600 ft fully loaded.
Take-Off run to clear 50 ft. obstacle—Less than 2800 ft fully loaded.
Landing Run (to full stop after clearing 50 ft obstacle)—Less than 2500 ft at 75,000 lb.
Transcontinental Nonstop Time—6 hrs 58 min demonstrated (record) 8½ hrs anticipated schedule.

WEIGHTS:

Equipped weight empty, including crew and all passenger service equip.—53,955 to 55,550 lbs.
Maximum Take-off Gross Weight—86,250 lb.
Maximum Landing Gross Weight—75,000 lb.

DIMENSIONS AND CAPACITIES:

Wing Span—123 ft.
Overall Length—95 ft 1 3/16 in.
Fuselage Height (static)—18 ft 8 3/16 in.
Height of Vertical Tail (static)—23 ft 7⅞ in.
Wing Area—1650 sq ft.
Maximum Oil Capacity—184 gal.
Total Mail and Baggage Capacity—450 cu ft below floor (5500 lb, or 13,400 lb with auxiliary flooring). Additional space above floor, optional.

GENERAL DATA AND PERFORMANCE OF THE DC-4 TRANSPORT

Mfgr. .....Douglas Aircraft Co., Inc.
Company Model DC-4
Army or Navy Designation
C-54 (Army), R5D (Navy)
Crew or Number Seats
5 Crew, 44 Passengers

Dimensions:
Span .....117 ft 6 in.
Length overall .....93 ft 11 in.
Height overall .....27 ft 6 5/16 in.

Area:
Wing (including aileron).....1462 sq ft.
Aileron .....123.4 sq ft.
Fin .....72.5 sq ft.
Rudder .....63.4 sq ft incl. rud. bal.
Stabilizer .....206.2 sq ft.
Elevator .....119.0 sq ft.

Wings:
Spar.3 Spar Wasner type beam construction
Ribs .....Formed sheet metal
Covering .....Alclad sheet

Landing Gear:
Type.....Retractable hydraulic tricycle
Tread .....24 ft 8 in.
Wheel type and size...Goodyear 17.00 x 20
Brake .....High pressure hydraulic
Loading gear shock unit
Oleo pneumatic Goodyear
Nose unit .....44 in.

Power Plant:
Make of engine
Pratt & Whitney R-2000-7 (4)
Take-off hp.....1350 each
Rated hp at 7000 ft.....1100 each
Fuel capacity.....3723 gal.
Range .....4300 mi.
Propeller-make .....Hamilton Standard
Diameter .....13 ft 2 in.

Performance:
High speed .....285 mph.
Cruising speed
235 mph (at altitude 10,000 ft)
Stalling speed .....80 mph.
Climb at sea level.....1200 fpm.

Weights:
Gross weight .....65,000 lb.
Weight empty .....39,000 lb.
Wing loading .....44.5 psf.
Power loading .....12.05 lbs/bhp.

POLYETHYLENE

—A Carbide Production Achievement for the Navy

Important New Plastic Has Many Unusual Properties

A little over two years ago, the U. S. Navy learned that the Carbide and Carbon Chemicals Corporation in collaboration with an associate company, The Linde Air Products Company, had developed a high pressure synthesis of a new material, Polyethylene, and it was found that this material was exactly suited to meet the Navy's requirements of an insulation for coaxial cable used in radar equipment.

At the Navy's request, these two companies, working together but entirely independent of anyone else, designed in their own Engineering Department, and built with their own Construction Organization a plant to produce polyethylene by a process different from any other commercial polyethylene process.

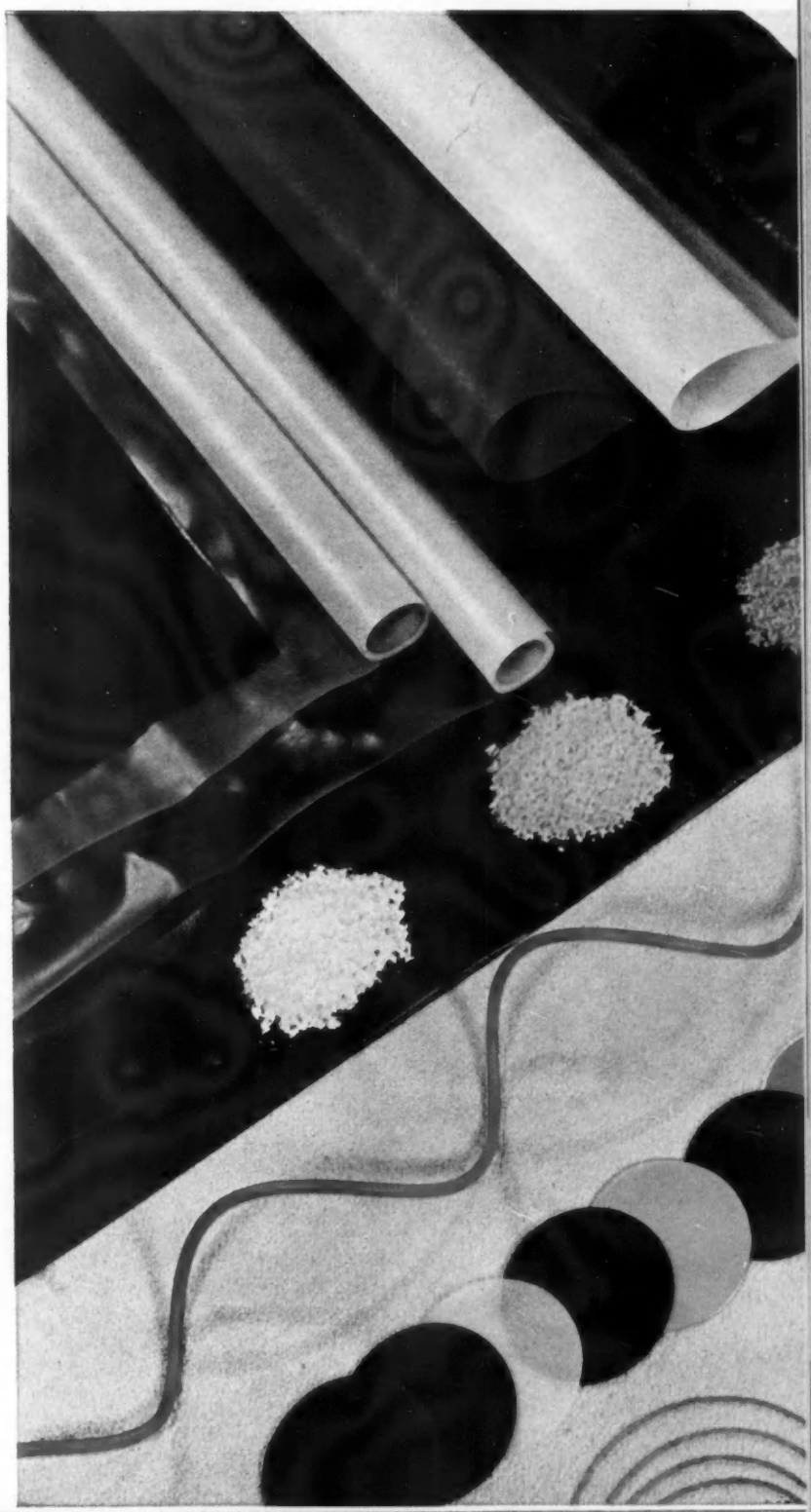
Within thirteen months from the date the project was authorized, this plant was producing at 180 per cent of rated capacity.

At the conclusion of the first full year of production the Navy Department told the plant:

"One year ago your plant commenced the production of polyethylene, a component of radio cable essential to the efficiency of electronic communications units and, therefore, vital to the success of naval operations. Production for the year has equalled 240 per cent of the rated output for the facilities. Everyone engaged in developing the product, planning, engineering, and managing the plant, and each of you engaged in producing polyethylene may be justly proud of a valuable contribution to the war effort."

Today, approximately two years after Carbide was given the assignment, this plant is producing polyethylene at 600 per cent of rated capacity and is providing the Navy's requirements of this material for use in coaxial cable.

(This advertisement has been reviewed and approved by the U. S. Navy Department)



Plastics Division

CARBIDE AND CARBON CHEMICALS CORPORATION

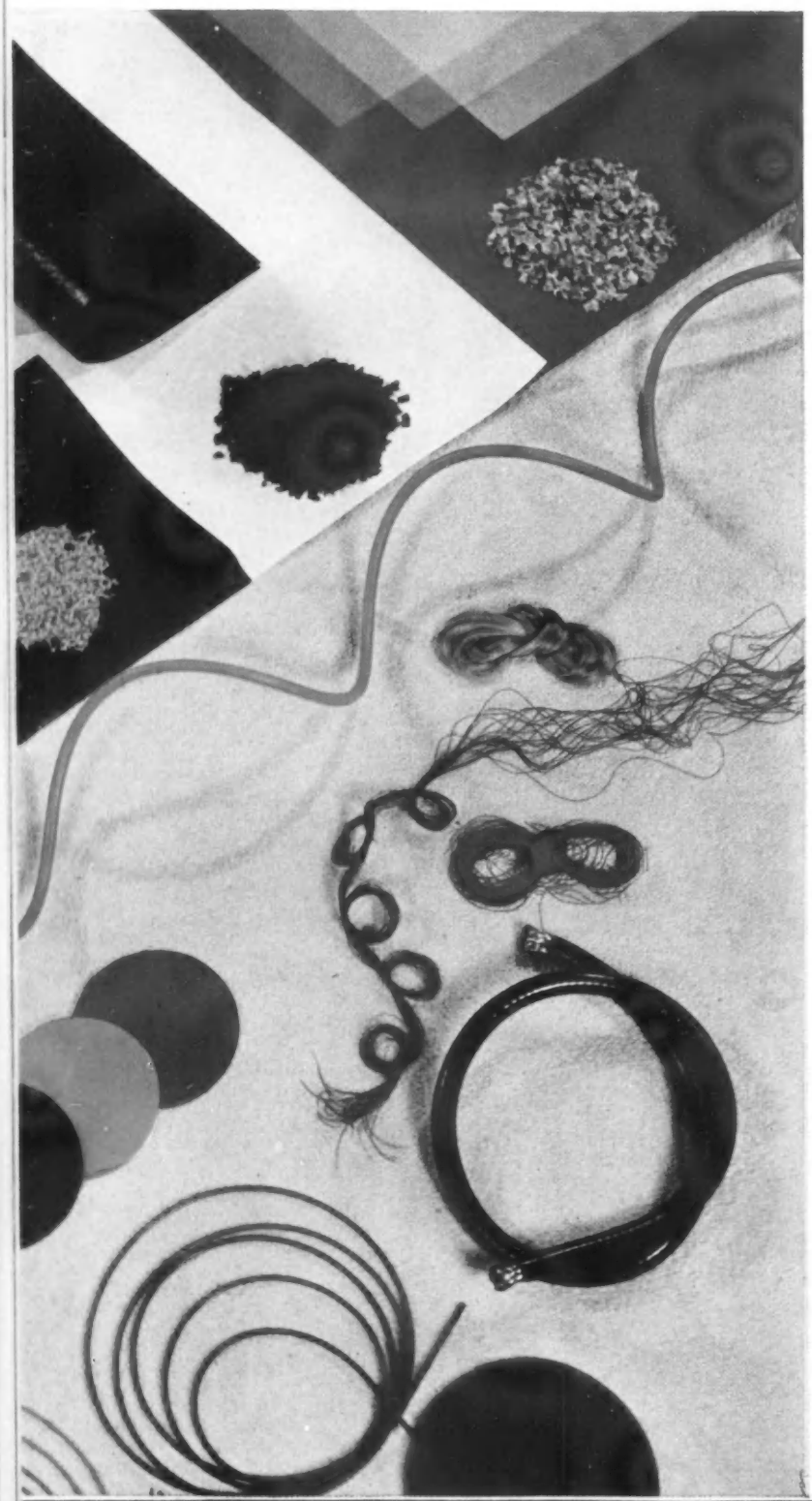
Unit of Union Carbide and Carbon Corporation

UCC

30 EAST 42nd STREET, NEW YORK 17, N.Y.

POLYETHYLENE

—A Carbide Production Achievement for the Navy



The Important New Plastic!

Polyethylene resins have the most favorable electrical characteristics of any plastic material for use in this electronic application. In addition, this new plastic material has many other exceptional characteristics, which suggest widespread application in many different fields. Polyethylene plastics are tough and impact-resistant. They are inherently flexible and extensible. They have an extremely low water vapor transmission coefficient and will absorb an unusually low percentage of water. Their chemical resistance is outstanding. Polyethylene is one of the lightest plastics, so light that it will float in water. It maintains its valuable properties over a wide range of temperature. It remains usable at temperatures lower than 90 degrees below zero, Fahrenheit, and is sufficiently rigid for use in temperatures up to 230 deg. F.

Polyethylene is colorless and translucent as originally manufactured but it can be formulated to produce colored products of exceptionally high lustre. These products can be fabricated by standard processes on existing plastics equipment.

Molded and extruded products, cloth coatings, flexible sheeting and film, and monofilaments are among the polyethylene plastic products which will be available in the future.

Polyethylene plastics are now restricted to applications covered by WPB Limitation Order No. 348. Technical data and samples for controlled end uses can be obtained by manufacturers with plastic-processing equipment by writing Plastics Division, Carbide and Carbon Chemicals Corporation.

(This advertisement has been reviewed and approved by the U. S. Navy Department)

Plastics Division

CARBIDE AND CARBON CHEMICALS CORPORATION

Unit of Union Carbide and Carbon Corporation

UCC

30 EAST 42nd STREET, NEW YORK 17, N.Y.

New Production Equipment

A NEW voltage regulator for use with most G-E resistance-welding controls that include the phase-shift method of heat control, is being offered by the General Electric Company, Schenectady, N. Y. The new regulator is designed to regulate the welding current automatically, so that it is held constant regardless of line-voltage variations of as much as plus 10 or minus 20 per cent.

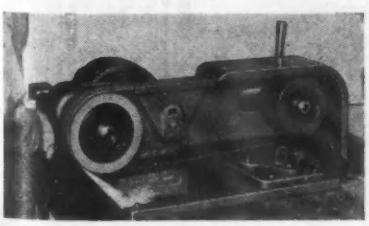
Known as the CR7503-D157, the

G-E voltage regulator

regulator consists of a resistor circuit connected to the power line which supplies the welding machine, and an electronic circuit. When the regulator is in use, this electronic circuit functions not only to hold the average voltage of the resistor current constant, but also changes, electronically, the phase control voltages of the main welding control panel. Thus if the line voltage drops, the regulator advances the phase control voltages, thereby automatically holding the welding current constant within close limits.

AS AN addition to their line of abrasive belt grinders, Porter-Cable Machine Company, Syracuse, N. Y. announces the Model BBS bench type belt grinder.

This new grinder unit uses an endless metal cutting abrasive belt 2½ in. wide by 60 in. long, running 4500 surface fpm, driven by a 1 hp motor. The design of this bench grinder provides a flat bed grinding area 2½ in. by 8 in. as well as a soft resilient contact wheel 7 in. in diameter by 2½ in. wide, which is adaptable for grinding all types of metal. Wheels 6 in. to 8 in. diameter can be used.



Porter-Cable model BBS bench type belt grinder

AIR REDUCTION, SALES COMPANY, New York, N. Y., has just placed on the market an improved circuit control panel for tack welding with a constant potential power supply. Known as the Wilson Type 30 special tack welding circuit control panel, it is of simple design and very compact.

The resistors of round nichrome wire are mounted on insulators and are designed well within the permitted tem-

perature rise. The housing has sheet metal sides with expanded metal top and bottom to provide for full circulation of air. The mounting brackets are so arranged that panels can be mounted side by side or one on top of another without restricting circulation.

Current values are controlled by specially designed contacts and are adjusted by turning fiber handles tight against a copper bus bar to connect the various resistors into the circuit. Resistors are disconnected by turning the handles in the opposite direction and locking them in position.

Panels are available in 150-amp and 230-amp sizes. The former has taps for 10, 20, 40 and 80 amp and the latter has taps for 10, 20, 40, 80 and 80 amp. Current adjustment on both units is possible in 10-amp steps.

EXTENDED anvil adjustable snap gages made by the Sheffield Corporation, Dayton, Ohio, are said to offer advantages in speeding up inspection and increasing production. Work is located easily and is quickly aligned with the gaging anvils. The extended anvil provides a stable bearing when presenting the gage to work in a machine. Used in a stand, this type of anvil provides a platform upon which the work piece is located in presenting it to gaging position.

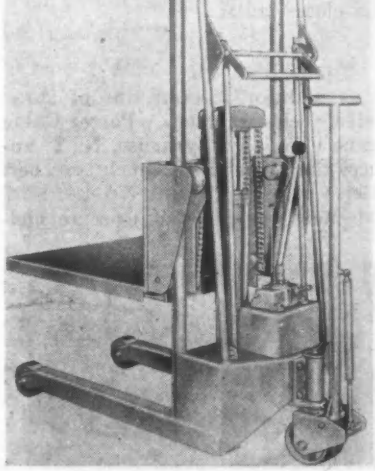
Sheffield extended anvil adjustable snap gage

A.G.D. locking devices are used on the adjustable anvils. Square type anvils are furnished as standard—pin type anvils may be supplied on request. Twenty-five standard models cover the range .000 to 6.625 in. and also provide the choice of two different height lower anvils. Larger sizes are available on special order.

WHAT is said to be a definite departure in material handling equipment has just been introduced by Lyon-Raymond Corporation, Greene, N. Y.

It is a combination of a lift truck and a tiering machine—a unification of the two basic principles—that of a rapid, easily manipulated lift truck, and that of safe, speedy lifting or tiering equipment.

The Lyon-Raymond hydraulic high-lift truck is light in weight (495 lb.) compared to equipment designed to do



Lyon-Raymond hydraulic high-lift truck

It's what goes on INSIDE *that counts*

Inside an engine, beware of wear!

Send for complete report, form 402, on "Radial Pressure Characteristics of Piston Rings."

RADIAL PRESSURE of piston rings must be *correct* and *uniform* to prevent excessive wear of cylinder walls. Because of their exclusive Heat-Shaping process, Pedrick *precisioneered* piston rings bear evenly against the cylinder wall. This process relaxes all the grains of the metal, removes the stresses of machining, and "fixes" the rings to exactly the correct shape and tension.

Thus, Pedrick rings have no high-pressure points to break through the oil film and cause excessive wear and scuffing. They have no low-pressure areas, either, which would permit oil to pass or combustion gases to blow by. The superior performance of Pedrick rings lengthens precious cylinder-block life, saves critical gas and oil, reduces tie-up time, and conserves the time of scarce mechanics.

In new or rebored cylinders, or in badly worn or tapered cylinders, Pedrick *precisioneered* piston rings deliver many hundreds of extra hours of top engine-performance. Leading automotive and aviation design and service engineers specify Pedrick rings for original equipment, and Pedrick rings in *guaranteed* Engineered Sets for reconditioning. Write for the full Pedrick story today.

WILKENING MANUFACTURING CO., Philadelphia 42, Pa. *In Canada:* Wilkening Manufacturing Co. (Canada) Ltd., Toronto.

Pedrick

precisioneered **PISTON RINGS**

INVEST IN INVASION . . . BUY WAR BONDS AND MORE WAR BONDS

this one phase of material handling, which accounts in a degree for its movability. It turns readily within its own length.

The standard stock model, with a platform 24 in. wide by 30 in. long, has a capacity of 1000 lb and a raising range of 42 in. Other models can be supplied to meet special needs.

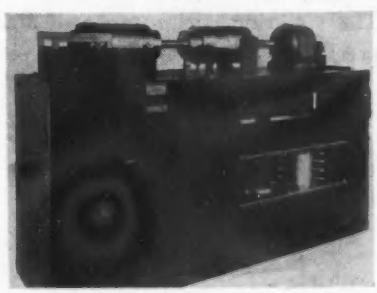
TWO new outdoor alternating-current welders, a 500-amp type and a 300-amp type, have been brought out by the General Electric Company, Schenectady, N. Y. The 500-amp welder has a current range from 100 to 625 amps, while the range of the 300-amp

G-E alternating-current welder

welder is from 60 to 375 amps. Both of the new welders are specifically designed for use in shipyards and similar outdoor locations where exposure to the weather is common.

These welders are equipped with an "idlematic" control which functions to reduce the output voltage automatically to less than 30 volts whenever the arc is not in operation, yet provides full power for welding directly the arc is struck. In addition, this control is provided with a switch, operated by a handle projecting through the top of the case, for shutting off the welder when not in use.

THE Baldwin Locomotive Works, Eddystone, Pa., has produced a new oversize rotating beam fatigue machine, designed to help "see around corners" in testing materials. It is



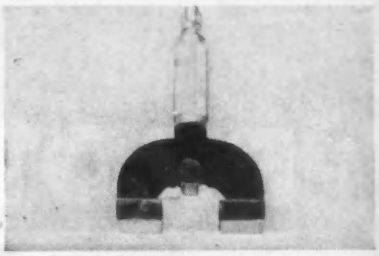
Baldwin rotating beam fatigue machine

based on published reports of studies which indicate that specimens of one inch minimum diameter eliminate "size effect" in fatigue.

The new model SF-10 R rotating beam fatigue testing machine has a testing capacity from 0 to 10,000 in.-lb., adjustable by units of five in.-lb. (bending moment) by position of weight on beam. Specimen length is adjustable from 3½ in. to 9½ in.

A NEW type of snap gage spindle for use with the Precisionaire instrument has been developed by the Sheffield Corporation, Dayton, Ohio. It is stated this is the first time any manufacturer has offered an application combining the features of snap and air-flow gages.

An advantage of this kind of spindle is that it can be used on highly finished or soft plated parts without marring or scratching them. It can also be used on thin-walled cylinders without any danger of collapsing them. The two other principal uses are for checking work while in the machine and for checking parts of large size or unwieldy shape which could not be presented to the gage.



Snap gage spindle being used with Precision instrument

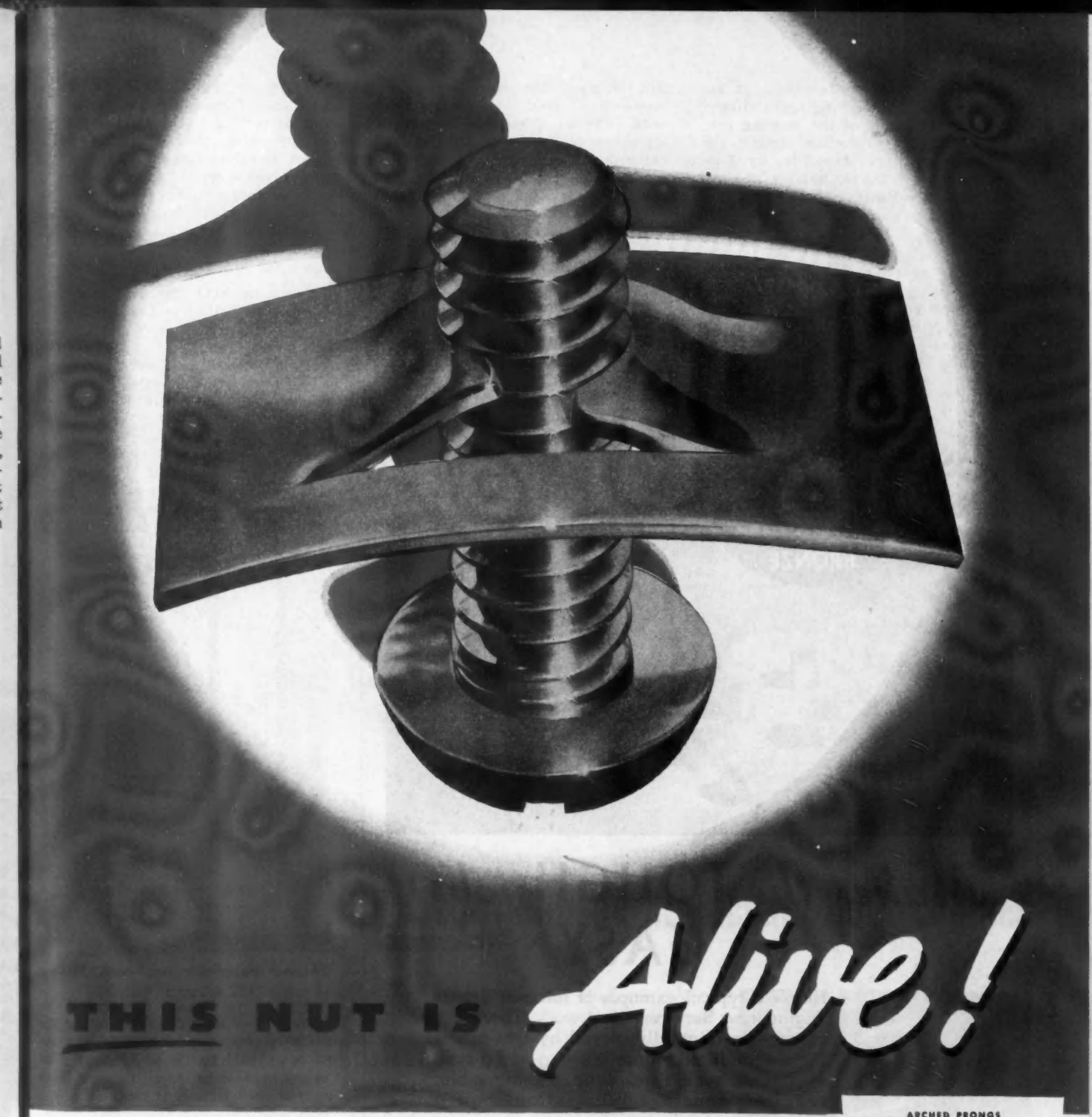
A MACHINE for marking delicate and precision parts having a ground or mirror surface that cannot be marred or distorted has been introduced by Jas. H. Matthews & Co., Pittsburgh, Pa., and is designated as the Matthews "Airgrit" marking of metal, glass, fibre or plastic parts is accomplished by means of a short blast of fine grit material against rubber or celluloid stencil masks upon

Matthews marking unit

which the part to be marked is placed. The desired marking, is cut into the stencil and the resulting mark is a light, clear-cut impression. Suitable fixtures are made to hold parts so that they can be quickly handled by the operator.

The unit is operated by air pressure and the operation is similar to sand-blasting. It operates most successfully on a volume of air at low pressure, five to eight lb. at the nozzle, and requires approximately 30 cfm while in operation.

AN IMPROVED 7-in. bench grinder has been added to the line of grinders made by Baldor Electric Company, St. Louis, Mo. This Baldor 7100 series grinder has a specially developed motor which is said to be cool running when carrying a normal load and to have 100 per cent overload capacity. Sealed, pre-lubricated ball bearings are used, eliminating the need for lubrication



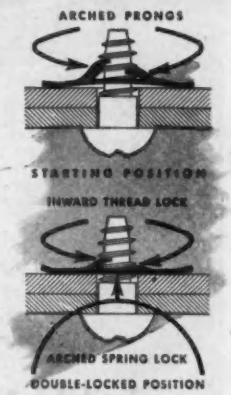
THIS NUT IS *Alive!*

Why? Because It's a *SPEED NUT*

SPEED NUTS are made of heat-treated, live spring steel. They have a live arched spring lock and an inward thread lock. Live spring action absorbs vibration instead of merely resisting it.

Before Pearl Harbor, over two million a day were used on automobiles, refrigerators, stoves, heaters, radios and hundreds of other products. When the shooting is over still more will be used because more engineers have learned that SPEED NUTS are lighter, double-locking and faster to apply. And in addition to all their exclusive advantages, SPEED NUTS still cost substantially less than other self-locking nuts. Write today.

TINNERMAN PRODUCTS, INC.
2059 Fulton Road, Cleveland, Ohio
In Canada: Wallace Barnes Co., Ltd., Hamilton, Ontario
In England: Simmonds Aerocessories, Ltd., London



Speed Nuts* [PATENTED]

*Trade... ...Reg. U. S. Patent Office

FASTEST THING IN FASTENINGS

during the life of the bearings. In addition to the felt bearing seals, slinger felts on the inside of the housing provide additional protection against the entrance of dust. The 7-in. by 1-in. wheels are selected for balance and are equipped with Baldor balancing flanges, assuring a minimum amount of vibration.

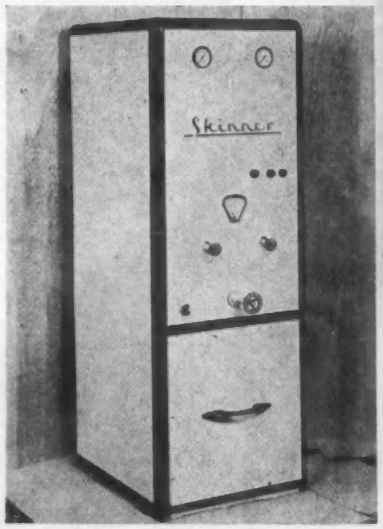
A NEW type Carboloy gage, with an exclusive segmented shank, has been announced by N. A. Woodworth Company, Detroit, Mich. Woodworth's segmented shank compensates for the difference in the coefficient of expansion between cemented carbides and steel—thus assuring a trouble-free bond between these two metals. The segments, separated by slots, allow for expansion or contraction resulting from temperature changes, with no distortion to the Carboloy gaging member.

Woodworth Carboloy gage

Carboloy cylindrical plug gages are manufactured in standard size ranges from .059 in. to 1.510 in. A Guide-Guard cap of shock-proof material provides protection to the Carboloy bushing-type gaging member and serves as a pilot, enabling quick location of the gage in the work. The cap, which is easily removed, permits the gages to be used for blind holes. The hollow bushing, plus the slots in the shank, form an air vent.

AN ELECTRICALLY operated automatic backwash filter is the latest addition to the line of filters made by Skinner Purifiers, Inc., Detroit, Mich. This filter is designed to operate continuously for the purification of lubricating oils, removing moisture, sludge, and dirt particles as rapidly as they contaminate the oil.

At predetermined intervals the flow of oil through the filter shuts off and a reverse flow of clean oil and air is caused to backwash the Skinner filter packs, thus removing the dirt that has accumulated on the outer edges. Within a few minutes this self-cleaning operation is completed. The cleaning operation is said to be so efficient that it is comparable to installing new filter elements each time it is cleaned.



Skinner automatic backwash filter

Canadian Distributor Of Adel Products

Appointment of Canadian Railway & Power Engineering Corporation, Limited, as exclusive Canadian representatives was announced by Adel Precision Products Corp., Burbank, Calif. aircraft and industrial equipment manufacturing concern. Not only will Railway & Power represent all products being manufactured for the aircraft industry but all other products being or to be produced for the marine, rail, bus, truck and transportation industries including output of Adel plants in Huntington, West Virginia as well as Burbank.

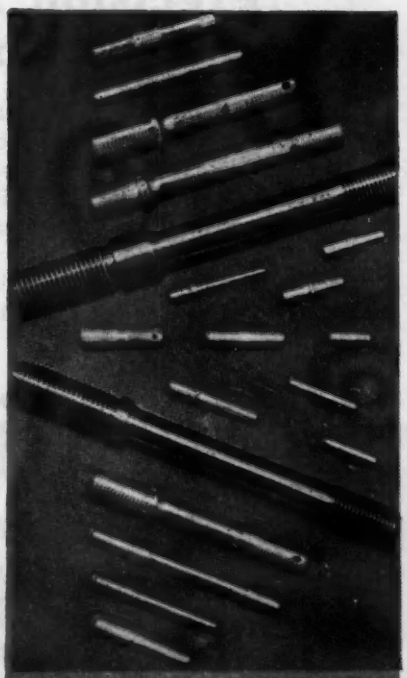
Pittsburgh Alloy Steel is used in Packard-Built Engines

IN the speedy Mustang that slashed cross-continent in a record breaking 6 hours, 31 minutes, *Pittsburgh Alloy Steel* went along for the ride. And when a Mosquito Bomber thundered Labrador to London in a time-clipping lunge, *Pittsburgh Alloy Steel* was ticking off the miles and minutes with it. For in the Packard-built Rolls-Royce engines that power these famous ships, precision parts made from Pittsburgh "aircraft quality" alloy bars, wire and tubing function vitally.

So what?

So *again* it has been clearly demonstrated that *open-hearth* alloy steel, as produced by Pittsburgh Steel Company, has achieved perfection that meets specifications for the toughest alloy steel applications. Only the *best* in steel is good enough to fly!

When your requirements for alloy grades combine the problems of manufacturing economy, *Pittsburgh* Alloy Steel, made by the Open-Hearth Process, can often fill the need exactly. Send us your specifications for analysis, recommendations and pricing.



The typical steel parts shown above are used in Packard Rolls-Royce engines and are machined from cold drawn, triple-alloy steel bar stock furnished by PITTSBURGH STEEL COMPANY.

PITTSBURGH STEEL COMPANY
1742 GRANT BUILDING, PITTSBURGH, PA.

PITTSBURGH ALLOY STEEL

BILLETS, BARS, WIRE, TUBING: ALSO CARBON AND STAINLESS STEEL

Bomber Output Raised

(*Continued from page* 23)

and permits more work to be handled by each drill and routing machine.

Crux of this achievement was: (1) To run almost all router jobs on layouts and (2) to set up all layouts on a conveyor line, eliminating practically all setup at the machines. Savings in scrap itself have been noteworthy.

The operation steps of this system, which has resulted in unusually efficient handling of aluminum sheet, are subsequently briefed: (1) Planning tickets come to the template crib where (2) Tickets, templates and router jigs are passed to the layout section. (3) When a sufficient quantity of orders have accumulated (the accumulation of templates is binned by designated colors in relation to metal thickness) templates are laid out and arranged on sheet size wrapping paper. Outlines are then marked. Templates and jigs are tied into separate bundles and racked in position on the conveyor line (4) The sheet is then perforated along the penciled template outlines. Tool holes are punched and part numbers stenciled. (5) From this master stencil, the layout is sprayed in red on the correct number of top sheets. (For example, since the run usually involves 160 sheets, the red stenciled top sheet is positioned with 15 added sheets under it so that it serves for the pattern of all 16, there being 10 such top sheets to the usual routing run to make up the routing run of 160 sheets). (6) Top sheets are racked between layout and material storage sections which are immediately adjacent to the conveyor line. (7) Starting in work, a 1200 lb table (whose dimensions accommodate a full aluminum sheet) is placed on the conveyor line. The sheets are stocked on it to be topped with the stenciled sheet and (8) the table is moved into position where the first tool hole in each part is drilled. (9) Pins are inserted in these first tool holes to maintain registry and the templates from the rack are arranged on the layout to match the painted outlines. (10) The rest of the tool holes are then drilled through the templates and (11) the rest of the tool hole pins are inserted. Additional lag screws are installed (if necessary) making the layout ready for pilot hole drilling, after which the table top is moved into temporary storage.

In the conveyor movement, certain station transfer points are uniquely facilitated with stanchions having ball-bearing heads. These are set upright in the concrete floor at waist height, spaced 18 in. apart in staggered position. The 1200 lb work tables, with little effort, can be moved upon these at will into any position for work or transfer and yet not interfere with the free movement of the worker.

(12) The table top is moved by overhead crane to one of the battery of radial drills where pilot holes are drilled. Templates are never removed or relocated at this point. (13) The table top, carrying the layout with pilot holes drilled, is then moved to one of the battery of routers, all of which are equipped with double tables. These radial drills and routers, operating somewhat on the pantograph principle of action, were originally designed by Kindelberger. They are recognized as a significant contribution to airframe sheet metal working. Router jigs are here installed, templates having been removed. The parts are routed, removing the scrap but not disturbing the parts or router jigs. These, still bolted to the table, are moved by crane to temporary storage. (14) Here the parts are removed and stacked separately in job accumulation racks. (15) The first cycle completed, the layout passes through as many times again as is required to complete the releases. The accumulated parts are then turned over to the burring section. The templates and router jigs are returned to the jig inspector to be re-cribbed.

There are over 9000 sheet metal details involved in the B-25 airframe. The NAA machine shop has hundreds of machine tools, and it machines over 500 parts in steel and magnesium. The

• A Matter of Designing and Applied Experience

Lubricant sealing is an engineering problem. It can only be satisfactorily solved with oil seals designed and engineered to adequately meet the conditions involved. More than ever before, sealing problems require engineering and experimental investigation since higher speeds and higher temperatures have to be considered, and totally effective sealing over longer periods of use is becoming increasingly important.

The Michigan Leather Products Company, over a period of many years, has specialized in solving sealing problems for industry including automotive, agricultural implement, and aircraft.

Consult us especially about oil seals where off-the-shelf types are not adequate. Our engineers will make a careful study of the conditions involved in your application and then specify a seal designed and engineered to fit your conditions.

Take advantage of our facilities and an accumulation of experience which can assist you whether your problems are concerned with present production or equipment that you are planning on for future markets.

MILPACO *Oil Seals*

MICHIGAN LEATHER PRODUCTS COMPANY

6317 EAST LAFAYETTE AVE., DETROIT 7, MICHIGAN

NAA policy is to be able to fabricate every airframe part, or to be in position to assure 100 per cent completeness of assembly, should any subcontractor fail in deliveries. From these and other NAA departments, parts and metal details flow into sub-sub-assemblies on the long trek to major unification.

Such major assemblies as wings and empennage flow into three major component assemblies of front, rear and center sections. The general NAA principle is to make each department as self-supporting as possible. There are some deviations from this, such as in spot welding, Erco punching and automatic riveting. Since everything cannot be covered, attention will hereafter largely be centered on technique in assembling the center section.

An example of the principle involved is found in the fact that this center assembly now supports sufficient work for a special spot weld department, in which five machines are now operating. There are some 1500 details involved in center section assembly. They are fabricated largely within the department, effecting repetitive advantages and better breakdowns.

The sub-assemblies for the center section flow along eight lines; upper skin, spars (left to right), lower skin, tank doors, bomb bay top, side panel, nacelle, and intermediate rib assembly. Upper and lower skin assembly moves along a line having a graduated step-up platform which brings workers to right height for drilling and riveting operations in relation to the work.

First position jigs locate on this center section line the extruded stiffeners onto the skins. Here the assembly is drilled out and tack riveted. Another NAA principle is to keep lines moving . . . thus tack riveting of only such sufficiency is accomplished as to provide proper support until the work reaches terminal station. Careful time study has indicated that in most plants, jigs tend to be used as holding devices. The NAA setup holds the time in which the work is on the jig down to minimum; riveting only to secure and then moving the work to the pickup line where it is drilled out complete and all rivets are driven. Specially designed, clamped former fixtures hold parts in contour. Parts move along on monorail conveyors. An electric feed rail is used for drills. When completed, an electric crane picks up the varied components of the center section and transports them to transfer, storage or further assembly.

Distinctive methods are in evidence on each minor assembly line. For example, some 1200 holes have to be drilled in each spar, right and left. This was once accomplished the hard way on the bench and required 12 workers. Now an overhead monorail transfer has been arranged, using a Delta or Walker Drill. This fixture permits the overhead drill to move in all directions to facilitate these drillings. The front spar lies flat, but the rear spar tapers upward. A table has been designed to compensate for this taper. Working right and left between these tables, one girl now drills out on both, accomplishing what 12 workers formerly did in less time. The saving in this one operation alone runs over $25,000 per year.

Another example involves fixture redesign at a former station on the spar pickup line where single small stationary pickup jigs were once used, being clamped on each spar end. These are now joined together and are provided with casters, located on a floor track. This redsigned fixture has freed the floor from all impedimenta of idle stationary jigs. It has given greater movement to the assembly's progress. It has accommodated a better breakdown with distinct advantages in transportation.

In the second position of the major assembly of the center section are installed such elements as top fairings, flap brackets, drillings for tank doors, gas web, front and rear spars. Thereafter transferred by crane to a continuous moving line, the center section begins its first position sequence of assembly through 28 stations on a continuous, moving line. The section travels on a platformed jig latched into two parallel chain drives and, completely assembled, finally moves into

In 1/50 of a second it stops stock-still

WHEN a plane pilot presses the button to adjust control flaps, he wants just so much motion and no more.

But electric motors take time to stop. They overrun.

So while electric controls were desirable because they were less vulnerable and didn't freeze up, they had the disadvantage of over-controlling.

What you see in the picture is the Lear solution. It is the Fastop Clutch.

With this clutch, controls stop instantly. For it stops stock-still in about 1/50 of a second.

There is nothing else like this Fastop Clutch. It is built right into the Lear electric motor as a unit.

As with all aircraft equipment, this unit had to meet unusual and rigid requirements of space and weight. It had to have rare power for its size. In fact the requirements were so severe, old-timers said it couldn't be done.

There will be many new conveniences and devices in the coming days of peace. Perhaps you are already planning one.

And perhaps you would welcome a motor like this and the Fastop Clutch — or some of the other 250 Lear products.

That is why we are telling you about them now. We want you to know that products like these are being made, and that there is available the kind of engineering that made them possible.

PLANTS: Piqua, O., and Grand Rapids, Mich. BRANCHES AT: New York, Los Angeles, Chicago, Detroit, Cleveland, Providence.

LEAR AVIA INC.
PIQUA · OHIO

paint operation. It is then cross transferred to take its position in final assembly.

Back at the start of the line where stiffeners are located onto the skins, I observe an unusual development in agreement with the principle of making every department self-supporting. There was being installed a new method to locate stiffeners on skins by means of horizontal jigs. On a table, stiffeners were first located between blocks. A routed aluminum sheet was correctly placed in location notches on this table and over the stiffeners. Then a drill template, hinged to the far side of the table, was dropped over the sheet and clamped into position. The drilling was then completed. This eliminates all pilot hole drilling. It is intended that all routing, as well as drilling, will be done on such horizontal jig setup. It will be necessary only to feed a split mill size sheet from the shears to this department, and this jig setup will complete routing, drilling and riveting. Perhaps 45 per cent of all handling outside the department will be done away with at an astonishing saving, and with definite acceleration of movement.

It is planned that this department movement will rotate from jig routing and drilling on the left side to riveting on the right side; the jig being unclamped at the end of the rotation and the part removed. The jig will then return to re-cycle. A tentative schematic of this layout is shown herein. These jigs are of Masonite and inexpensive. The same technique will be installed on all such sub-assembly lines wherever adaptable.

Naturally, greater production per square foot necessitates fullest use of all types of conveyor equipment. The NAA Kansas plant has 2000 ft of monorail serving the wing and empennage assemblies, 1550 ft of track serving the three major section assemblies, 800 ft of monorail serving the airframe after major section are mated. This is a three rail setup, two tracks serving to suspend the wing and one the nose. There are 1925 ft of V-type floor conveyor which prevents falling stock, such as bolts and nuts, from clogging travel. Casters are shaped to fit this track. There are 3850 ft or floor chain conveyors. Floor conveyors have two rails until final assembly when three rails fit three jack points to accommodate various work stands that facilitate reaching the work. Final assembly travels on four wheels with a detachable extension that comes up to the front end of the ship and is accommodated by a third rail.

A 24-station overhead monorail accommodates the engine line. A new monorail empennage conveyor line transports each assembly high up near the high bay roof, where such assemblies are stored on the monorail over their final assembly stations. All lines except the conveyor on the very final assembly line are constantly on the move.

There are 100 stations in the final assembly line. Of these, 63 are served by overhead and 37 by floor conveyor. Operations are made as repetitive as possible on all assembly lines. Center, front and right final assemblies mate at station 50 and there remain a final 50 stations thereafter. These move on an intermittent continuous line.

Efficient Production Of Heavy Bombers

Consolidated Vultee Aircraft Corporation's San Diego and Fort Worth, Texas, plants now hold the two top positions in the United States in the efficient production of heavy bombers. Official War Production Board figures show the company's Fort Worth division has achieved a reduction of 56 per cent in manhours required to build B-24 Liberator bombers to advance from ninth place to a position second only to the parent San Diego division.

Daily output per man doubled in a five month's period at Fort Worth, enabling the plant to achieve a reduction of 51 per cent in personnel involved directly in B-24 production. During the same period the plant's Liberator output, scheduled rigidly by the Army Air Forces, climbed 1.4 per cent.

MARMAN ALUMINUM ALLOY CLAMPS SAVE WEIGHT

. . . in many instances more than 50% compared with steel clamps of equivalent strength

Marman's patented design requires no severe forming, and clamping action does not develop stress concentrations anywhere in the clamp assembly. Thus the full strength of aluminum-alloy or any other metal is utilized. Marman's aluminum alloy clamps are particularly suited for aircraft ventilation, carburetor intake, supercharger, intercooler and similar installations where medium or large size clamps are required.

CHARACTERISTICS OF ALL MARMAN CLAMPS

Circumferential Loading

Tension is uniform around any convex surface. No bulging, pinching or distortions.

Quickly Installed Quickly Removed

Marman Clamps may be opened and wrapped around any connection. May be installed and removed repeatedly without efficiency loss.

Every Size and Shape

Circular, oval, square, oblong and irregular shapes are all easily handled with Marman Clamps.

MARMAN clamps

MARMAN PRODUCTS CO. Inc.
940 WEST REDONDO BOULEVARD
INGLEWOOD, CALIFORNIA

MARMAN

Tuthill Important Producer of Leaf Springs

(*Continued from page* 29)

the discharge end of the furnace, an automatic handling mechanism takes each leaf, as it comes to the end of the furnace, and feeds it into the forming machine. This is a horizontal bulldozer type machine with a punch press built into the fixed end. The punch press, tripped automatically, punches a center bolt hole when the cambering forms are closed. As the forms open, the leaf is ejected into the quenching oil bath below the machine. A conveyor then transports the quenched leaf to a box, ready to be taken to the draw furnace.

Medium length leaves (18 in. to 34 in. long) are formed and quenched in a similar machine, but longer leaves are formed in an entirely different type of machine. It consists of an endless chain carrying seven forms, each having a different radius. These forms travel over four sprockets so arranged that three forms are always above the quenching oil, while four are immersed in the oil. A wide walking beam type, continuous heating furnace delivers a hot leaf every six seconds to the operator, who places leaf No. 1 on form No. 1, etc. A bank of adjustable keys descends to shape the hot leaf to the form. The keys are then raised, leaving the spring leaf latched to the form which moves horizontally over the end sprocket and down vertically into the quenching oil, while form No. 2 comes along into place under the vertical keys. The leaves are placed on the furnace conveyor in the same sequence as the forms are on the quenching machine chain. They are quenched endwise in a deep oil tank, not edgewise. Leaves quenched on edge are said to be subject to warpage edgewise, requiring hand peening later to straighten them.

Following the forming and quenching operation, the leaves go through the tempering or "draw" furnace. This is a continuous recirculating type furnace with automatic temperature controls. It takes one hour for this operation, traveling on an alloy steel woven wire mat. At the discharge end, a fine water spray cools the leaves so that they may be handled immediately.

After quenching, the leaves are usually shot peened on the inner or tension side. This is done on a "wheelapeener" machine made by the American Foundry Equipment Co. The leaves are carried on a rubber protected chain through the blasting compartment, where No. 28 round shot are thrown by centrifugal force against the spring leaves. The effect is to increase the life of the spring by setting up an initial compression in the inner tension surface.

Spring leaves now are ready for assembly. Bushings are pressed into the spring eyes, then "faced" in a double ring wheel grinder to the exact width required. The rebound clips are riveted on, and the leaves clamped together. A center bolt is inserted in the bolt hole, and a nut run on to hold the assembly together. Each spring is tested on a bulldozer type machine, giving the spring a deflection in excess of that possible on the vehicle. It is then checked for proper camber and capacity rate. Some springs may be given a prime coat of paint, others are shipped unpainted. Replacement springs, sold through parts jobbers, usually are painted black and stenciled with their part number.

In addition to these production facilities, the company operates a service station across the street for repairs and replacement of springs on vehicles. This department is equipped with small universal type equipment possessing sufficient flexibility to reproduce single leaves or complete spring assemblies, tailor-fitted to each individual job.

PHYSICAL AND CHEMICAL PROPERTIES OF "dag" COLLOIDAL GRAPHITE

1 Slippery—a Good Lubricant. Softer than talc

2 Conducts Electricity

3 Withstands Temperature Extremes

4 Absorbs, Radiates and Conducts Heat

5 Maximum Purity

6 Low Coefficient of Expansion

7 Particles Bear Like Electric Charges

8 Insoluble in Acids and Alkalies

9 Black and Opaque

10 Gas Adsorbent

11 Little Photoelectric Effect

12 Miscible with Most Fluids

13 Films Adhere Tenaciously and Dry with Sharp Edge

14 Microscopically Fine Particles.

15 An Excellent Suspension

Available as a smooth, black, liquid concentrate, Dag colloidal graphite puts a versatile company of physical and chemical properties at your service. Fifteen of the more important of these properties are listed here with a different color given to each for easy reference.

Match these properties by color with the colors on the medals below. Each medal represents a typical performance "citation" to Dag colloidal graphite. Dozens more could be shown, if space permitted, because this product is a dry film, a fluid film, a surface coating, an impregnation—and a few other things besides.

"Mr. Dag"

2 14 13 15

2, 14, 13, 15
CITATION: "Drive belts and other nonconductors traveling at high speed accumulate static charges which under certain conditions may constitute a hazard. This static electricity is controlled and bled-off harmlessly by a Dag colloidal graphite conductive film."

1 3 5 14 15

1, 3, 5, 14, 15
CITATION: "When the work rotating chuck of this large honing machine was assembled and run-in using Dag colloidal graphite, running-in time was reduced approximately 35%, operating temperature dropped considerably, and the danger of bearing damage due to temporary oil film failure was eliminated."

9 13 6 14 15

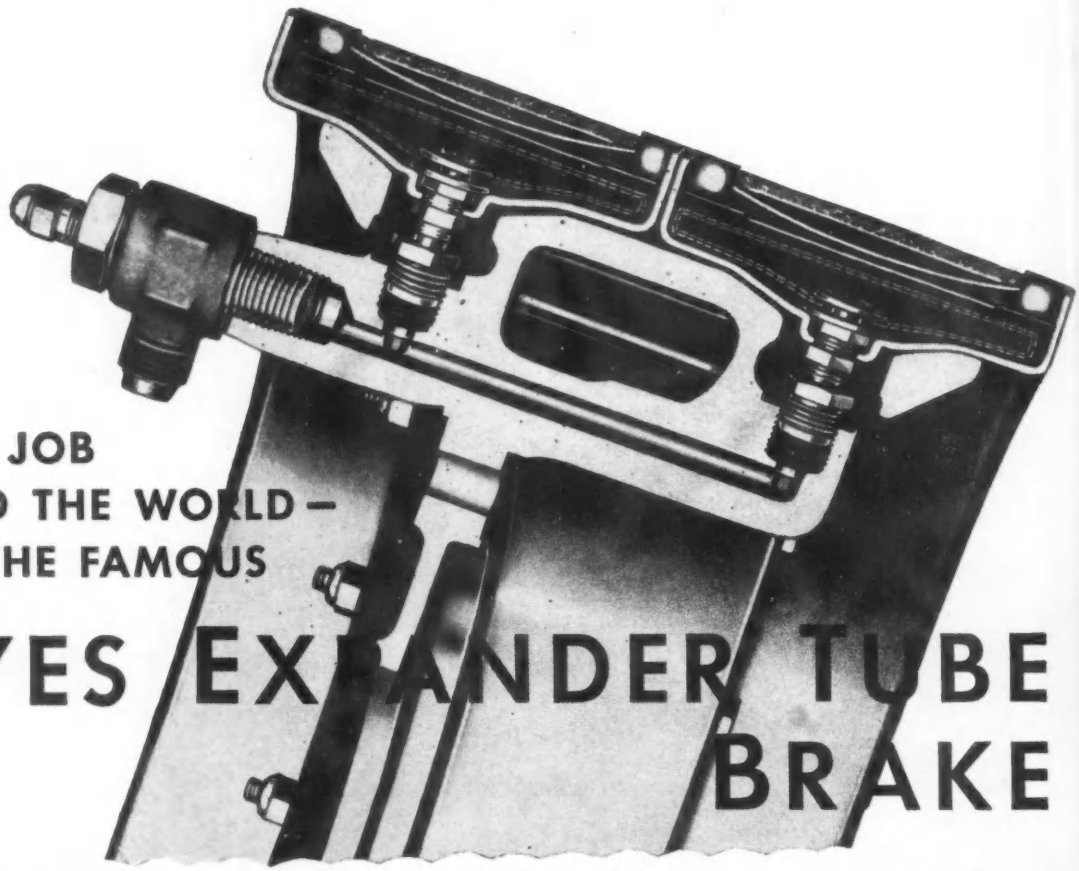
9, 13, 6, 14, 15
CITATION: "Dag colloidal graphite is used to retouch photograph negatives because of its complete opacity, because a film of minimum thickness is required and because it dries with a sharp edge."

PIN A MEDAL ON YOURSELF!

CHECK THE LIST and pick out those properties which you can use. Then state your problem to us and let our engineers give you the benefit of their experience. It is quite possible that they have already studied a parallel application. You'll pin a medal on yourself for calling in Mr. Dag.

dag COLLOIDAL PRODUCTS

ACHESON COLLOIDS CORPORATION
PORT HURON, MICHIGAN

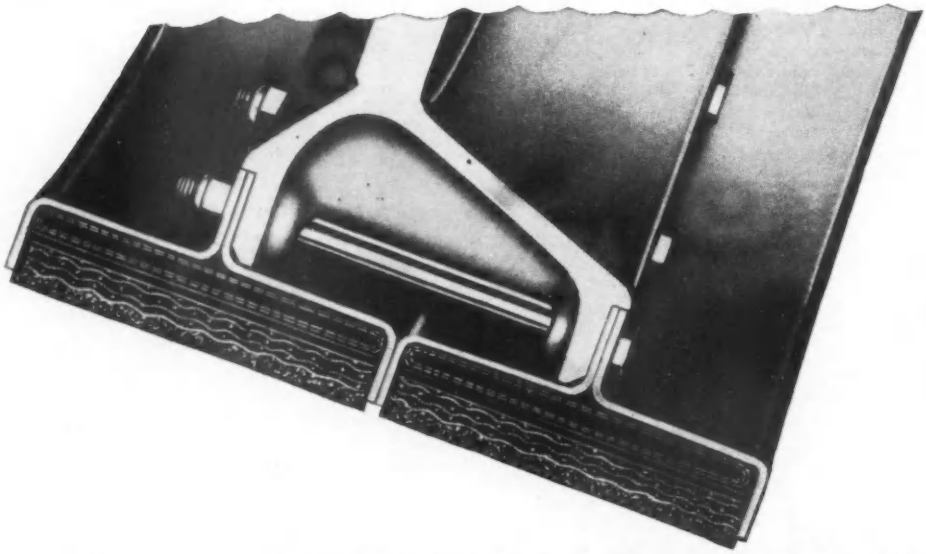


ON THE JOB
AROUND THE WORLD—
HERE'S THE FAMOUS

HAYES EXPANDER TUBE BRAKE

From the giant 56″ wheels and dual duplex brakes on the B-29 Superfortresses, Liberators and Flying Fortresses—to the smallest 4″, 5″ and 6″ wheels and brakes on Piper and Stinson Airplanes . . . pilots and ground crews, aircraft engineers and designers, all know the war-proved performance of Hayes Expander Tube Brakes under rugged conditions.

Long service life, easy maintenance, freedom from grabbing and fading, rapid heat dissipation, accurate functioning whether in sub-zero or tropic temperatures, and reliable performance under greatly increased loads and landing speeds for the same size wheels *—all are proved in war as they were in peace.*



Western Representative: Airsupply Co., 5959 W. 3rd St., Los Angeles 36, Calif.

HAYES INDUSTRIES, INC. Home Office: JACKSON, MICHIGAN, U. S. A.

New Products for Aircraft

Seals for Tubing

Protection against dirt, tampering and careless handling of aircraft tubing and hex nuts is being achieved through an application of Cel-O-Seal caps developed by the I. F. Schnier Company, San Francisco, Cal., western distributor for the product which is manufactured by E. I. du Pont de Nemours and Company, Wilmington, Del.

Cel-O-Seal caps are hood closures made of non-fibrous pure cellulose. No

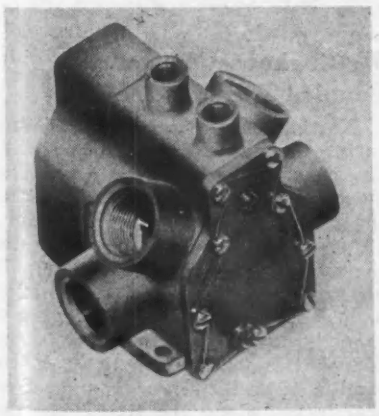
Cel-O-Seal caps

metal is used in their manufacture. Applied quickly by hand, the closures shrink in drying, conforming exactly to the contours over which they are placed. Anti-sabotage protection is provided when the re-opening of a once-sealed tube signals tampering to plant inspectors. Specifications of the seals vary to suit particular needs of various applications.

Remote Positioning Four-Way Control Valve

Adel Precision Products Corp., Burbank, Cal., offers a new remote positioning 4-way control valve, No. 13261. This valve permits regulation of high-pressure hydraulic systems with the Adel ISOdraulic remote control system. The unit illustrated has a 16 gpm flow, 3,000 psi, and is designed for ¾-in. lines. Units for other flows and pressures are available.

Weight and installation savings are



Adel control valve

accomplished through use of ISOdraulic controls comprising an independent system operating from —65 F. to 165 F with either master or slave or both at either extreme. The new valve is adaptable for a large variety of control installations in combination with other standard units such as positioning of wing flaps, dive brakes and steerable nose wheels in aircraft as well as hydraulic operation of road-working, automotive and marine equipment.

Flameproof Synthetic Rubber Coated Cloth

Designed to solve several problems which have faced the aircraft industry in combat planes, a new glass, flameproof, synthetic rubber-coated cloth has been brought out by United States Rubber Company, New York, N. Y.

(*Next page, please*)

Great tensile strength at abnormally high temperatures, extreme lightness in weight and high tear resistance are its main features. In addition, it is fireproof, gasoline-proof, oilproof, greaseproof, waterproof, mildew and insectproof, and not affected by acids or alkalis.

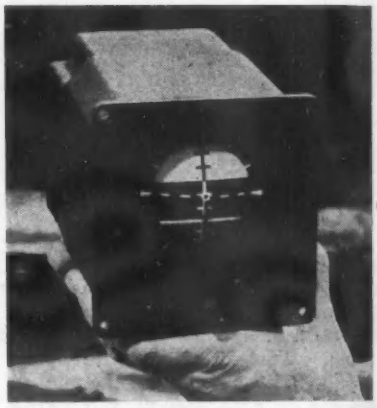
One important use is to protect personnel in Superfortresses and Flying Fortresses at high altitudes, through the elimination of possible breaks in metallic heating ducts caused by vibration and other contributing factors. By sealing joints in metallic hot-air ducts, this material gives the plane's heater system greater efficiency, insuring essential, quick distribution of heat.

Instrument Indicates Attitude of Plane

A new flight instrument capable of providing the pilot with precise attitude indications throughout 360 deg of roll and pitch is announced by the Sperry Gyroscope Company, Great Neck, N. Y.

The pilot, by means of Sperry's attitude gyro, is provided with a visual indication of the position of his aircraft with reference to the earth's surface throughout all possible attitudes through which his airplane can be maneuvered. The Sperry attitude gyro is adaptable to all types of airplanes and is said to be particularly valuable to those aircraft whose mission requires extensive and complicated aerobatics.

As in other gyro flight instruments, a gyroscope is the heart of the new Sperry attitude gyro indicator. Electrically propelled around a vertical axis, the gyro employs the familiar gyroscopic properties of rigidity and precision to provide a fixed reference pattern around which the plane may be maneuvered in any direction. This new feature is made possible by a method of suspension. The reference pattern is marked on the surface of this stabilized sphere with luminescent paint and is visible to the pilot



Sperry attitude gyro

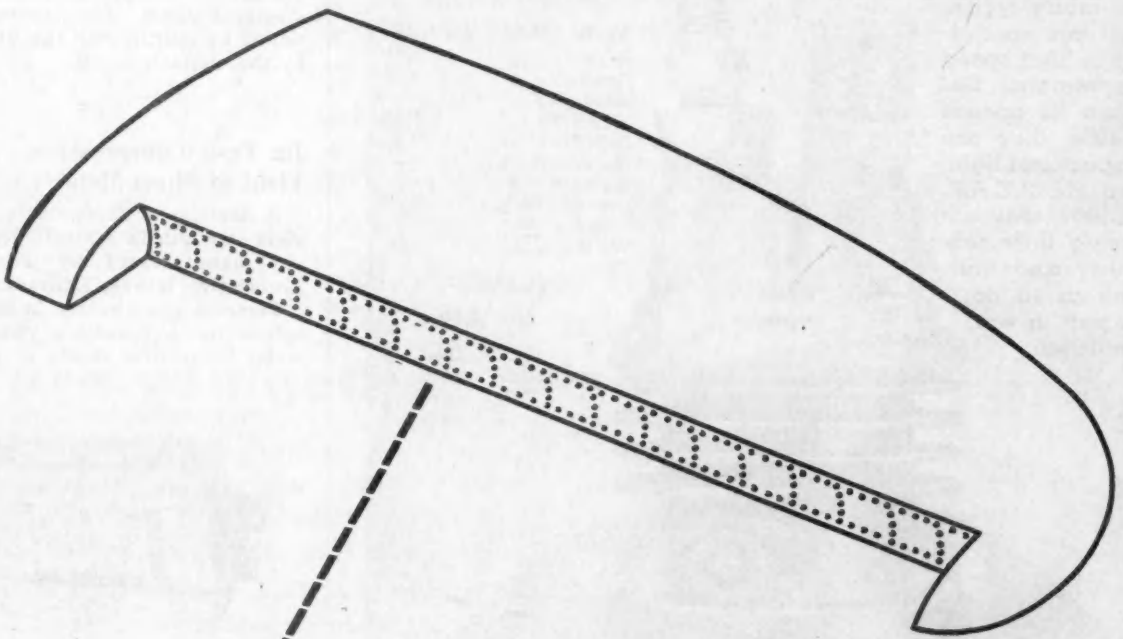
through a masked opening in the front of the instrument case.

The indicating sphere is divided into hemispheres by painting the upper half white luminiscent and the lower half black. Latitude lines in contrasting color are inscribed with short 10 deg marks between them. A vertical meridian line, also in contrasting color, gives roll angle indication with reference to a fixed index on the mask around the sphere. A lateral lubber line, marked in alternate black and white sections, stretches across the center of the mask opening and provides the basic pitch index for reference to the pattern of the sphere.

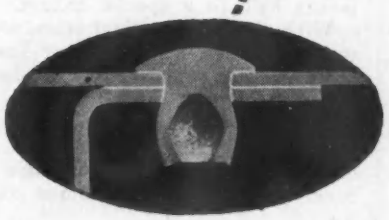
Westinghouse Magnetic Coupled Torquemeter

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has developed a magnetic coupled torquemeter which is said to determine the power output of aircraft engines 10 to 15 times more accurately than the method now commonly used. The instrument measures the twist of the hollow steel shaft which connects the propeller to the engine. The amount of twist, which may be only a few thousandths of an inch in a distance of several inches along the shaft, is an accurate measure of the driving force de-

CLOSING STABILIZERS ...in a hurry



Another typical job for Explosive Rivets



CLOSING HORIZONTAL and vertical stabilizers on an outstanding plane is a blind riveting operation which proves again that Du Pont Explosive Rivets can save time and reduce costs.

Explosive Rivets are easy to use. Holes are drilled, rivets are put in place and each rivet head is touched with an electrically heated Du Pont Riveting Iron. This causes the tiny charge in the end of the rivet to expand. Result: a tight-fitting blind head that securely holds the rivet in place. Operators can set these one-piece, non-mechanical rivets in two seconds . . . 15 or 20 a minute.

Whenever there's blind riveting to be done, Du Pont Explosive Rivets can save you time and reduce costs. Check into their advantages now. Write for detailed leaflet on "How to Use Du Pont Explosive Rivets." E. I. du Pont de Nemours & Co. (Inc.), Explosives Department, Wilmington, Del.—General Motors Bldg., Detroit, Mich.—5801 South Broadway, Los Angeles, California.

DU PONT
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EXPLOSIVE RIVETS

The one-piece blind fastener

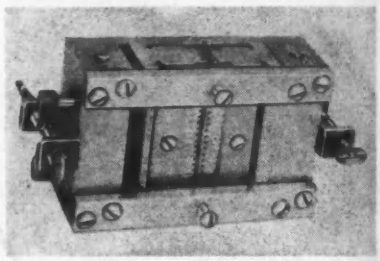
livered to the propeller by the engine.

Projecting from rings on the propeller shaft are two sets of gear-like teeth whose faces are a few thousandths of an inch apart. A stationary metal sleeve and coil assembly encircles the propeller shaft. As the shaft twists under load, the distance between the teeth changes, causing a variation in the magnetism across the gap between the metal sleeve and the shaft. This variation is shown electrically on a dial mounted on the instrument panel. Horsepower is determined by multiplying the dial reading by the engine's speed.

Jig Tests Compression Yield of Sheet Metal

A new jig to determine compression yield strength in aircraft design is being manufactured by The Baldwin Locomotive Works, Eddystone, Pa.

Common practice has been to obtain values for compression yield in sheet metal by testing sheets in packs—the



Baldwin sheet metal testing jig

sheets being piled to a thickness equal to the width of this test sheet, and the pack would then be supported by needle points held in a special fixture.

With the new method it is possible to test a single thickness of sheet in compression, supporting the sheet in the jig with a multiplicity of small rollers. The extensometers are attached to the edges of the sheet. The testing of the material in single sheet form simplifies the technique of testing.

Low Pressure Check Valves for Oxygen

The Deutsch Company, Los Angeles, Cal., has just released a new series of low pressure oxygen check valves which are said to embody radical improvements. One special feature of these new values is the poppet which eliminates excessive squeezing of the sealing element and does away with the possibility of the gasket tearing loose or cutting through and being lost in the line.

The internal construction incorporates the "O" ring sealing principle. The various styles meet all A. N. envelope dimensions. The valve operates as a sleeve valve, the clearance

NEW

Added Data with Ryerson Alloys

Are you getting this important help?

Ryerson has always exercised close control over alloy steel quality and for several years has furnished the chemical analysis and heat treatment response data with each alloy shipment. Now, this service has been extended under the Certified Steel Plan to give new additional information . . . much more helpful than before.

A new type of Report, containing both hardenability and analysis data, now is being sent with each Ryerson alloy shipment. In addition to the chemical analysis, every alloy heat stocked by Ryerson is subjected to four separate end-quench tests in our own laboratory. The results of these tests, when interpreted through tables of known physical relationships, reveal the obtainable tensile strength, yield point, elongation and reduction of area for 1, 2, 3 and 4 inch rounds quenched and drawn at 1000°, 1100° and 1200° F. Reports include all this test and heat treatment information, plus recommended working temperatures. Thus, you know the complete chemical analysis, what working temperatures to use; and how the steel will respond to heat treatment.

Ryerson continues to positively identify all alloys. They are color marked according to type. Large bars are individually stamped, and smaller bars are bundled and tagged with a heat symbol. This identification is entered on every Report Sheet; so cross-reference verification between Report and steel is unmistakable.

Whether you order a single bar or many tons, you can be sure Ryerson will furnish Reports covering every alloy shipped. Both steel and Reports are delivered together on local shipments. When shipment is made by other than Ryerson motor service, the Reports are sent by first class mail and addressed to the heat treating department.

We believe the uniform high quality of Ryerson alloys—the careful testing—accurate identification—the new, complete guide data—metallurgical counsel—and quick shipment—make Ryerson your number one source for alloy steels from stock.

We urge you to use this unique service.

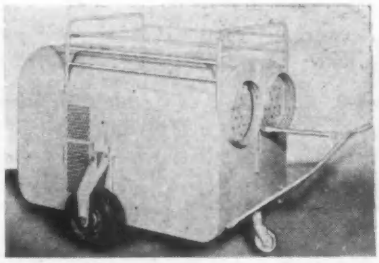
Joseph T. Ryerson & Son, Inc., Chicago, Milwaukee, Detroit, St. Louis, Cincinnati, Cleveland, Pittsburgh, Philadelphia, Buffalo, New York, Boston.

RYERSON STEEL

of which is sealed by an "O" ring type gasket when the valve is closed. The sealing element is made from special freeze resistant neoprene of low Shore hardness to insure proper functioning between —65 F and 160 F.

Portable Heater

A portable lightweight heater of high capacity, made by Harvey-Whipple, Inc., Springfield, Mass., has an output of 275,000 minimum to 300,000 maximum BTU per hour. It burns either high octane gasoline or fuel oil and has automatic electric ignition of flame. Operation is by a lightweight gasoline engine running in a compartment which may be closed as desired, with controllable heat directed to carburetor and crankcase. The entire power plant may be removed by one man in 30 seconds, and another installed in less than two minutes. No wrenches are required for this change, due to a quickly detachable, multiple fuel line joint and hand-operated bed clamps.



Harvey-Whipple heater

New Buna N Fuel Resistant Stock

A new Buna N fuel resistant stock (233-5), which retains a tensile strength of over 100 psi and elongation of over 100 per cent after being subjected to aircraft engine oil at 300 F for a period or 70 hours, has been introduced by Los Angeles Standard Rubber, Inc., Los Angeles, Cal.

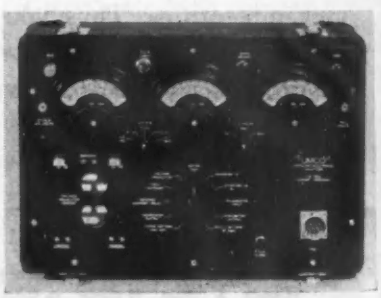
This Buna N stock was designed for oil seals, oil rings and other applications requiring resistance to aromatic fuels. It remains flexible at —40 F and has a very low compression set.

Non-Skid Airplane Walkway Coating

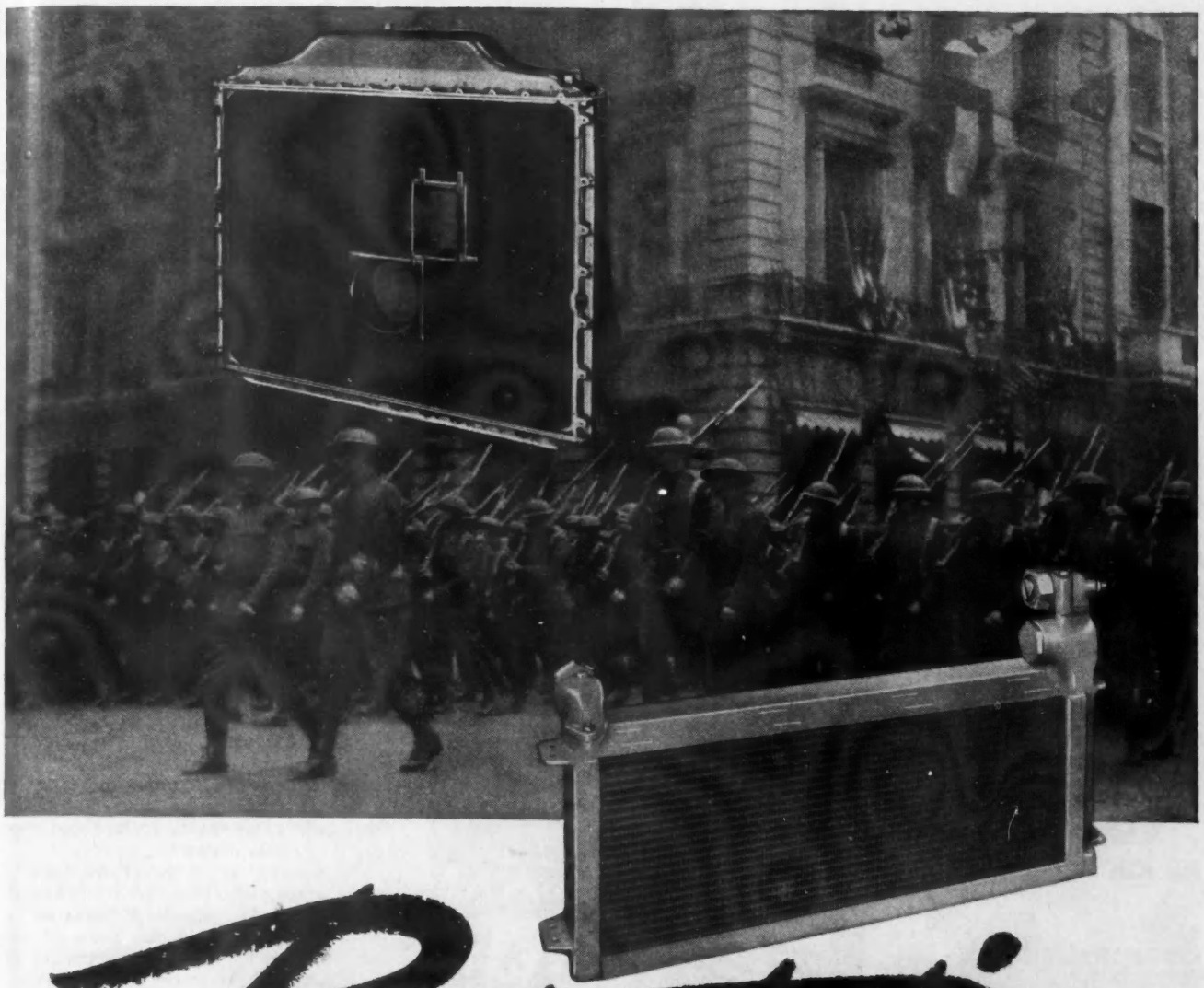
A non-skid airplane walkway coating that is less than one-fifth the weight of rubber matting, adheres to metal, plywood and painted surfaces, remains flexible at temperatures ranging from minus 20 F to 160 F, and is resistant to fire, gasoline, aromatic fuel, salt water, oils and bydraulic fluid, has been developed by the Minnesota Mining and Manufacturing Company, St. Paul, Minn. Made of Thiokol synthetic rubber and ground cork, this surfacing material is applied at room temperature with an open nozzle paint spray gun. It can also be applied with a knife or brush, and patches so constructed blend well with the original coating.

Portable Aircraft Electrical Analyzer

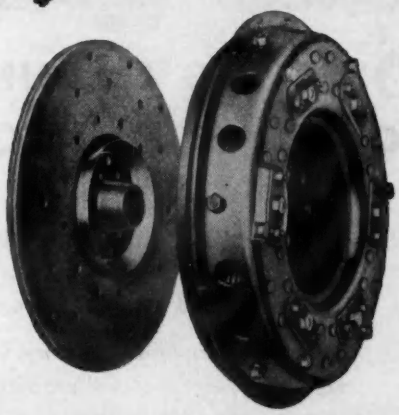
Wiring and electrical troubles on 75 per cent of American aircraft can be analyzed and located by a lightweight portable testing unit manufactured by the United Hydraulic Mfg. Co., Los Angeles, Cal. It can also be used for checking open circuits, short circuits and measuring resistances of any circuit element. The unit complete with all accessories weighs approximately 25 lbs.



Testing unit made by United Hydraulic Mfg. Co.



Reputation



Long's reputation for quality, dependability, and performance went to war 25 years ago and again with Japan's attack on Pearl Harbor. Today, Long radiators, clutches, and oil coolers are serving on all war fronts, hastening Allied victory . . . helping bring the day when they can return to peacetime vehicles.

LONG MANUFACTURING DIVISION
BORG-WARNER CORPORATION

ARMY E NAVY

DETROIT 12, MICHIGAN
WINDSOR, ONTARIO

LONG
CLUTCHES • RADIATORS • OIL COOLERS

Carbide-Tipped Cutters

(*Continued from page* 40)

lowed the mass to cool, and dissolved away the nickel menstruum with aqua regia. The crystalline substance we obtained is harder than tungsten-carbide, *WC*. He have proved that by measuring the hardness with a new hardness tester, by diamond penetration methods, and at present indications are that the hardness number for $WTiC_2$ is around 2600, and to give you an idea of the other substances, silicon-carbide on that scale is around 2150 to 2250, and tungsten-carbide, *WC* is about 1950. When you have a tool metal containing constituents which are harder than silicon-carbide, then grinding it with a silicon-carbide wheel in a rigid fixture is an impossibility. Of course the percentage of this $WTiC_2$ varies from about 20 to 60 per cent in the different grades, and while it is feasible with off-hand grinding to grind these compositions, it requires diamond wheels to grind them without causing defects or cracks, both thermal and mechanical.

Effect of Cutter Design in Milling

By B. P. Graves, Director of Design, Brown & Sharpe Mfg. Co.

IN general our results are in agreement regarding chip loads and surface speeds. We have found that higher speeds of 700 to 800 fpm are suitable for the very soft steels. For heat-treated steel around 320 Brinell best results have been found at about 300 fpm.

The use of flywheels seems to be necessary, however, undesirable from the design standpoint. They do improve finish and make cutting action smoother. We cannot say from our tests that a flywheel gives a greatly improved tool life. Flywheels should be as near the cutting tool as possible.

We are in agreement that negative angles require more power. In tests on heat-treated steel, around 320 Brinell, we have found a gradual increase in power amounting to about one percent per degree of negative true rake on the cutting edge when this true rake varies from about zero deg to 20 deg. negative.

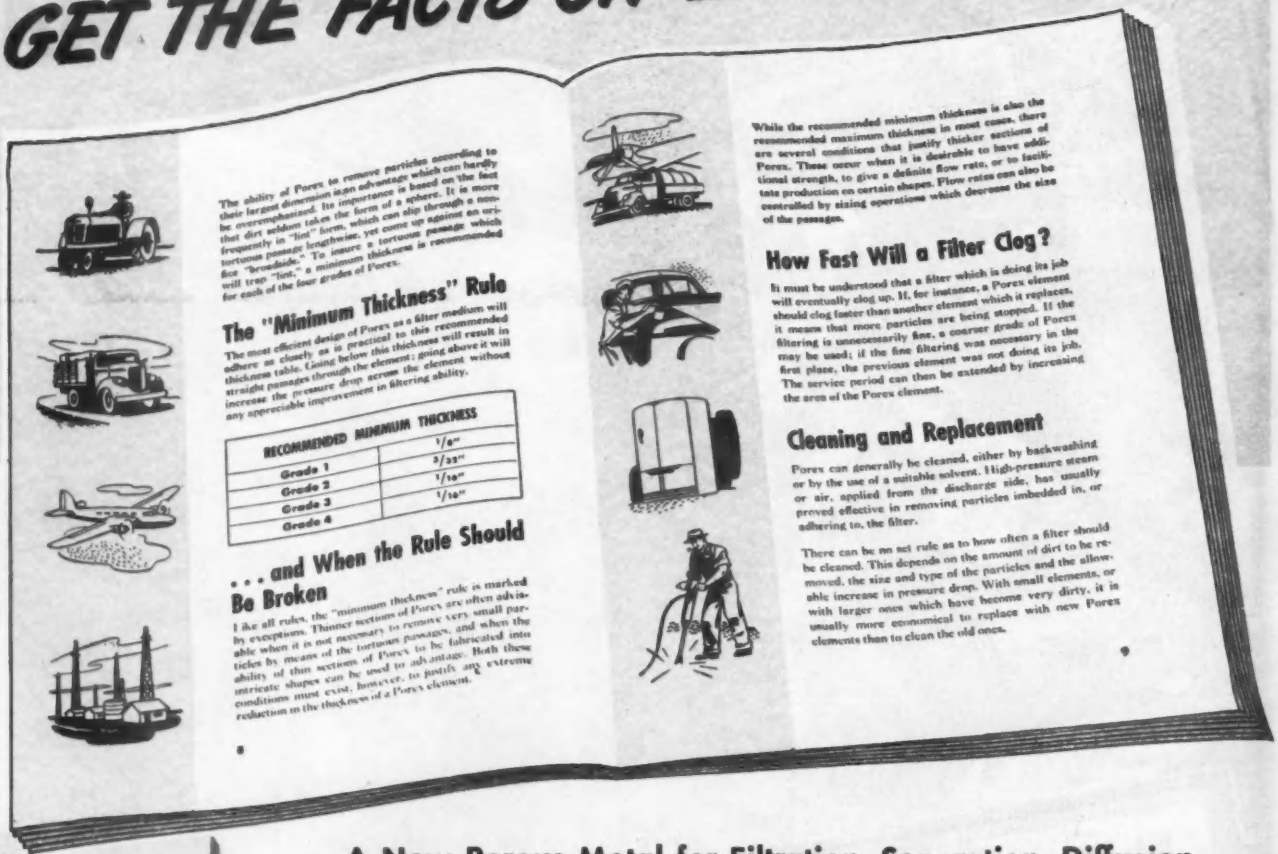
On the matter of power we seem to be in widest divergence from the figures presented. At Brown & Sharpe we have made input output tests on the machine used for the experiments so that actual horsepower at the cutting edge can be readily obtained. Our figures for heat-treated steel at about 320 Brinell show that it only requires from 0.8 to 1.0 hp per cu. in. of stock removal when a tool is new. This may increase as much as 50 per cent as the tool becomes dull, but this would indicate a very dull tool. It has been our experience that power increases gradually with wear.

We have not found large ratios of cutter diameter to work width to be detrimental. On the contrary our experience has been that they are more favorable. Again, our experiences has been that larger lead or bevel angles have proved more durable. No improvement has been found at angles greater than 45 deg.

In this same connection it should be noted that for a condition where the two negative angular components are equal as for instance with seven deg. negative rake and seven deg. negative helix the maximum true negative rake on the cutting edge occurs when the bevel angle is very close to 45 deg. Under these conditions, if the clearance has been held constant, the cutting edge is formed by a more obtuse angle than when the bevel angle is only 15 deg. This results in a

You're behind the times if you don't

GET THE FACTS ON POREX



The ability of Porex to remove particles according to their largest dimension is an advantage which can hardly be overemphasized. Its importance is based on the fact that dirt seldom takes the form of a sphere. It is more frequently in "line" form, which can slip through a non-tortuous passage lengthwise, yet come up against an irregular "broadside." To insure a tortuous passage which will trap "line," a minimum thickness is recommended for each of the four grades of Porex.

The "Minimum Thickness" Rule

The most efficient design of Porex as a filter medium will adhere as closely as is practical to this recommended thickness table. Going below this thickness will result in straight passages through the element; going above it will increase the pressure drop across the element without any appreciable improvement in filtering ability.

RECOMMENDED MINIMUM THICKNESS	
Grade 1	1/8"
Grade 2	3/32"
Grade 3	1/16"
Grade 4	1/16"

. . . and When the Rule Should Be Broken

Like all rules, the "minimum thickness" rule is marked by exceptions. Thinner sections of Porex are often advisable when it is not necessary to remove very small particles by means of the tortuous passages, and when the ability of thin sections of Porex to be fabricated into intricate shapes can be used to advantage. Both these conditions must exist, however, to justify any extreme reduction in the thickness of a Porex element.

While the recommended minimum thickness is also the recommended maximum thickness in most cases, there are several conditions that justify thicker sections of Porex. These occur when it is desirable to have additional strength, to give a definite flow rate, or to facilitate production on certain shapes. Flow rates can also be controlled by sizing operations which decrease the size of the passages.

How Fast Will a Filter Clog?

It must be understood that a filter which is doing its job will eventually clog up. If, for instance, a Porex element should clog faster than another element which it replaces, it means that more particles are being stopped. If the filtering is unnecessarily fine, a coarser grade of Porex may be used; if the fine filtering was necessary in the first place, the previous element was not doing its job. The service period can then be extended by increasing the area of the Porex element.

Cleaning and Replacement

Porex can generally be cleaned, either by backwashing or by the use of a suitable solvent. High-pressure steam or air, applied from the discharge side, has usually proved effective in removing particles imbedded in, or adhering to, the filter.

There can be no set rule as to how often a filter should be cleaned. This depends on the amount of dirt to be removed, the size and type of the particles and the allowable increase in pressure drop. With small elements, or with larger ones which have become very dirty, it is usually more economical to replace with new Porex elements than to clean the old ones.

You should know about

POREX

A Unique Porous Metal Produced by Powder Metallurgy

Please write on company letterhead, giving title.

A New Porous Metal for Filtration, Separation, Diffusion, Flow Control, Flame Arresters, Vents and Breathers

In this book you'll get the facts—the "imagineering" information and engineering data—on an *absolutely unique metal* that has been developed by Moraine Products to serve industry. Its potential field of application includes practically every product that involves the flow of fluids, gases or air . . . every process where the flowing medium should be filtered, diffused, separated or controlled. Porex is serving in Diesel engine injectors, lubricating systems, pneumatic tools, refrigeration compressor systems, fuel systems and scores of other applications in which efficiency can be increased or precision parts safeguarded by the function of this porous metal element.

Included in the book are 70 charts of flow curves—tables of physical properties — design information — application data—and complete description of the material and its functions. Send for your copy today. Moraine Products Division, General Motors Corporation, Dayton, Ohio.

WAR BONDS Save Lives!

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GENERAL MOTORS

stronger edge. In the case being considered both these effects are quite small, but they do favor more life.

Carbide milling with multi-tooth cutters requires considerable horsepower and high feed rates to take full advantage of the high speeds and high chip loads that are found best for good cutter life. It is possible, with milling jobs of moderate size, to overload some present day equipment even when using only one or two tooth cutters. It is therefore obvious that if best results are to be obtained from this new technique manufacturers must design cutters in line with the power of the vast number of machines in service.

Calculating Number of Teeth in Cutters

Tests	Speed (SFM)	Feed (IPM)	Balance Wheel	Remarks	Parts Machined Before Grinding
Test A	425	15¾	No	Extreme vibration Poor finish	10
Test B	900	20	No	No vibration Good finish	40
Test C	425	15¾	Yes	No vibration Excellent finish	220

Momentum in Carbide Milling

By E. O. Lowell, General Partner, Grayson Mfg. Co.

AN EFFECT resulting from heavier chip loads is a reduction in consumed power required to remove a given quantity of material. It has been found that only 75 per cent additional horsepower is required to remove a 100 per cent heavier chip. It can be readily seen that with the increasing of chip load, the friction and therefore the wear on the cutting edge does not increase proportionately with the amount of material removed.

With the employment of heavier chip loads, it became necessary to determine a means of imparting momentum to the cutting operation by the use of increased mass rather than speed. The first efforts in this direction, other than the use of a relatively heavy gear train and small cutter was an attempt to use greater body thickness and cutters of larger diameter to perform the job. It would have been effective were it not for the fact that when the momentum is increased by increasing the diameter of the cutter, the disadvantageous tortional stress is proportionately increased, thus the full effect of the increased momentum was lost by producing a hammering effect as the cutting tooth made impact with the workpiece. The constant pounding resulting from this load and fire action was highly deterimental to the carbide, thus again resulting in decreasing cutter life. As a result of this experience, John H. Grayson, realized that momentum should be imparted to the cutting action by a flywheel considerably larger in diameter than the milling cutter itself, and with sufficient mass to impart the momentum necessary to eliminate the rotary hammering effect.

The first application was the mounting of a 12 in. diameter 110-pound flywheel on the back end of the spindle of a small gear-driven five horsepower milling machine. The hammering was eliminated and cutter life was greatly increased, as set forth in the following in the above table.

Following this original application, flywheels have been used on many carbide steel milling jobs with equally advantageous results. Thus, it is now believed that moderate spindle speeds and heavy chip loads (0.005 in. per tooth *minimum*) with the aid of adequate momentum through mass results in the most satisfactory production records for the milling of steel with carbides.

More on Leadership

(*Continued from page* 15)

undiverted, had plunged us? Are the bald implications of these platform paragraphs indicative of honest leadership, or are they at least mildly suggestive of arrogant and unscrupulous demagoguery?

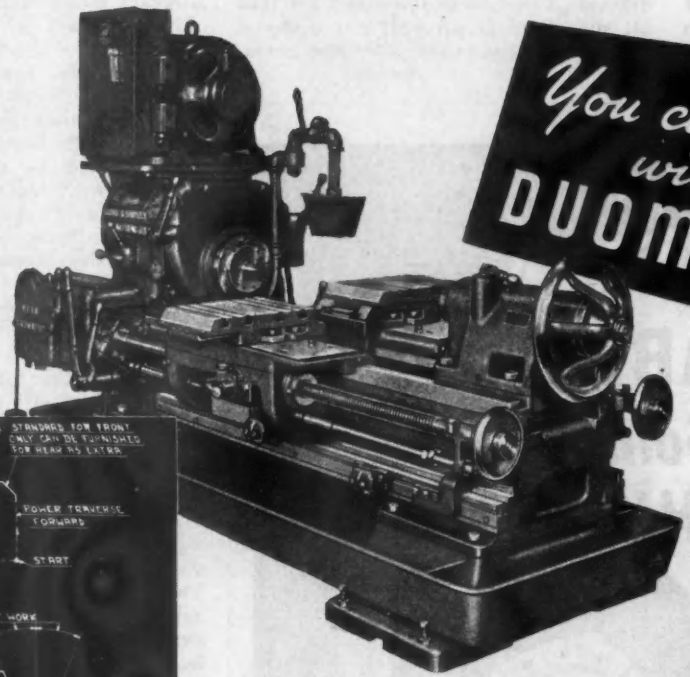
Governor Kerr, in his keynote address, pointed to what he called "the tragic years of 1929 through 1932," and the "awful" depression and unemployment of those four years. He did not, however, give his hearers, as he might have, unemployment statistics for the years 1933 to 1936. In the period he did cite, unemployment averaged only 6,207,000 while in the latter period, which he studiously ignored, it averaged 10,066,000, or an increase of more than 62 per cent.

Governor Kerr did not say, as he might have if he had been anxious to tell the whole truth, that the depression of 1929 was world-wide and that the rest of the world snapped out of it beginning in 1933 while we alone, under the leadership of his party, slumped steadily into a much worse condition with unemployment reaching an all time high of 12,744,000. He did not say that even in 1937, the best year from the employment point of view between 1933 and the beginning of the war, the average unemployment was 6,732,000 or more than it was in "the tragic years of 1929 through 1932." He did not say that it took the war to do what his party's administration was unable to do so far as unemployment is concerned.

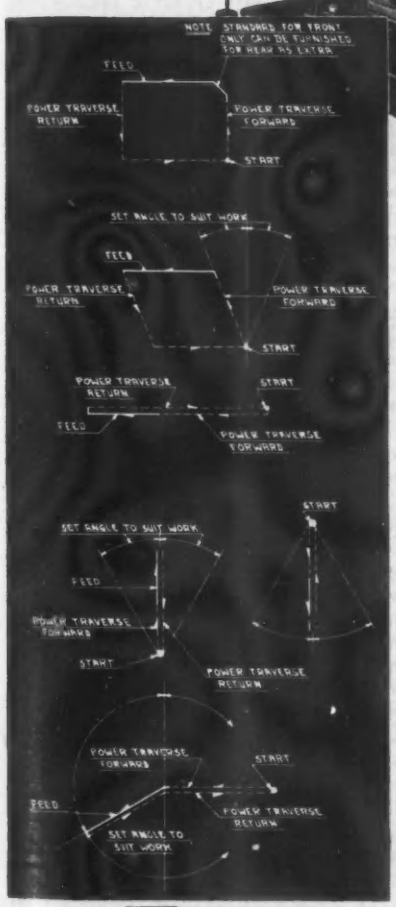
Now, it is seriously submitted, is such misrepresentation through distortion and half-truth characteristic of the type of leadership that the masses of the people in this republic need? Is it to be found as a part of the leadership which our founding fathers and our outstanding statesmen of the past provided? Can it be found in the utterances of George Washington, of Thomas Jefferson, of Abraham Lincoln, of Grover Cleveland or of many others that could be named from among the great men of principle who rank high in our country's history?

In his post-nomination acceptance speech the presidential candidate of the party from whose platform and keynote address the quotations above were taken said, "I shall, however, feel free to report to the people the facts about matters of concern to them and especially to correct any misrepresentations." It will be interesting to note whether he will consider it his duty to the people and feel free to correct just the few misrepresentations and the truth distorting half-facts that are pointed out herein.

Any Combination of TURNING or FACING CYCLES . . . *FRONT and REAR!*



You can do it with a DUOMATIC



The range and combination of cycles obtainable on the Lodge and Shipley Duomatic represents a major advance in automatic lathe design.

Two independent tool slides and carriages—front and rear—can be operated singly or together. Any combination of "in" or "out" facing cycles on one tool slide, and either turning, boring, or forming operations on the other tool slide, are performed without the use of special attachments.

These dual slides allow more advantageous use of multiple tools, permitting quantity production never before possible. Yet small lots of lathe work are produced with equal facility.

The many automatic features on the Duomatic enable even the unskilled operator to produce at a high peak of efficiency. All movements and setups are mechanical, and no cams are required to change cycles. As a result, the Duomatic is unsurpassed among automatic lathes in producing more work with less time and effort.

Turn your jobs to best advantage . . . consult Lodge and Shipley Engineers for complete recommendations. Full details on the Duomatic can be obtained by writing on your company letterhead for Booklet No. 601 FL.

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ENGINE AUTOMATIC TOOL ROOM OIL COUNTRY LATHES

Disposal of Surplus Aircraft

(*Continued from page* 17)

the Joint Chiefs of Staff. There are certain tactical-type planes, such as photo reconnaissance and observation aircraft having non-combat uses for which there is an approved foreign demand, all of which will be classified for orderly and watchful disposal.

Surplus tactical aircraft in excess of what is required for international transfer and determined to have no commercial use should be segregated immediately as unabsorbed surplus. Such planes, it is suggested, should be disposed of within four months after being declared "surplus," unless negotiations for transfer are pending at the time. But regardless of any progressive overlap caused by separate batches of planes being declared "surplus" at different times, it is recommended that all such tactical aircraft not disposed of within three years after the cessation of hostilities should be classified as "unabsorbed surplus."

It is estimated that many transport aircraft (Class B) may be declared "surplus." The committee recommends that during the period of short supply of these B-class surplus planes, the Surplus War Property Administrator should decide which airlines, both domestic and foreign, should have precedence in receiving allotments. Both for domestic and foreign distribution, aircraft manufacturers should be permitted to act as the United States Government's agents, on a basis of reasonable fee compensation, in order to establish factory-customer relationships as rapidly as possible. Negotiations for the disposal of Class B aircraft should be conducted, wherever possible, with the ultimate user rather than the user's government, with due regard for "timing," so as to not impede the development of a general international aviation policy. To achieve such interpretation of purposes, it is suggested that the services of the Aircraft Advisory Board be invoked. It is recorded that only a very few serviceable transport types of planes may be declared "surplus" abroad, so that whatever planes of the B-class do find their way to overseas buyers likely will come from the "surplus" reserve in the United States. Transport planes designed for foreign commercial or private use should be shipped "as is." The committee expresses the belief that surplus Class B planes should be made available in the United States through lease, a terminable installment plan, or by cash sale. The use of these three methods should provide flexibility of disposal processes. In the foreign field, possible changing conditions probably will require the exercise of wide discretion.

Regarding price policies, the committee recommends that price determinations for transport planes be uniform as to method, and approached with primary consideration as to their actual value in airline operations. In the case of transport aircraft of larger capacity and more desirable operating characteristics, and a longer economic life, the price should be adjusted upwards. It is indicated that in the adoption of these general principles of price policy, there will be developed a wide distribution of B-class aircraft for transport purposes among present non-users, and that much new air traffic will be created thereby. At the same time, new foreign markets will be created. The committee warns against the danger of granting special prices on aircraft suitable for use in foreign air transport operations which might compete with United States airlines.

Class C personal aircraft, up to 11,000 pounds gross weight, will be suitable for training, fixed-base operations, non-military, private, and governmental use. It is recommended that disposition during the short-supply period should be made similarly to that advocated for Class B (transport aircraft). Sales should be made "as is,"

Heat-treater putting a piece of a sectional die into a Vapocarb-Hump Furnace in plant of Liberty Tool & Die Corp., Rochester, N. Y. This Furnace is kept continually busy because of the high-quality work it makes possible.

Photographed immediately after Vapocarb-Hump Hardening, this die by Bastian Bros. has no trace of scale on its intricately-engraved face.

Distortion during heat-treatment, which could obviously cause much trouble with this sectional die, was completely avoided by the use of the Vapocarb-Hump Hardening Method. Liberty Tool & Die Corp.

Heat-TOOLS ARE WEAPONS—TREAT 'EM RIGHT!

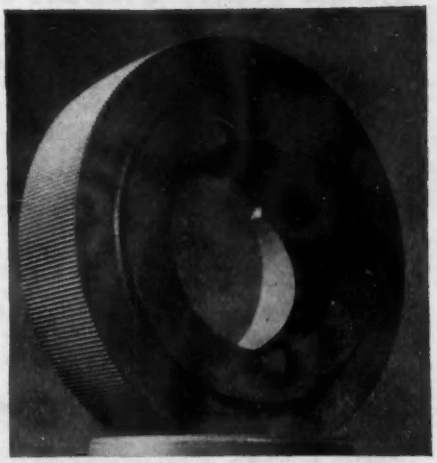
With the three-way help of the Vapocarb-Hump Method of hardening thousands of heat-treaters are finding that they, no less than the toolmakers and machine-tool operators, can help enormously in saving tools, tool steels and toolmakers' time. For when a heat-treater puts a tool into a Vapocarb-Hump Furnace, he has complete control of what the furnace does to the tool:

1. *The tool can't pit or decarburize; it must leave the furnace with surface as smooth as when it entered. Vapocarb protective atmosphere sees to that.*

2. The tool can't develop unexpected warp or distortion if the heat-treater uses his skill and knowledge. Temperature distribution is highly uniform; temperature measurement and control are the most accurate that Micromax Pyrometers can give; the proper rate of heating for each tool can be individually discovered, and automatically held.

3. *If there's any doubt as to the proper quench point, the Hump Method can be used to show the heat-treater exactly where the tool stands, in relation to its critical, at all times. The Hump Method assures the depth of hardness which will enable the tool to give the absolute maximum of productive life.*

An L&N engineer will gladly discuss a particular application of the Vapocarb-Hump Method, or send a catalog, as you prefer.



Deep hardening and minimum distortion, required in these parts for a Waterbury Farrel cold-heading machine, are secured by means of Vapocarb-Hump Hardening. Finish-grinding of such parts was reduced 80% when this Method was adopted in the big New England plant.

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A Slogan For Every American

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and only for cash, to prevent speculative buying. Prices for Class C planes should have administrative elasticity. Planes of popular demand should be sold under sealed bids, with the right of rejection of all bids if too low. Those requiring sales effort should have a fixed price system with discounts and commissions. Sales through manufacturers and dealers should be encouraged. The committee states that no immediate transfer of personal aircraft planes should be made to Class E (unabsorbed surpluses), but "trainers" should be released and sold at low cost for training purposes.

It is urged that aircraft equipment and components, classified as "D," should be inspected by manufacturers on a fee basis and that the Government should arrange for the necessary overhaul of the equipment. Manufacturers selected to do the overhauling should act as agents of the Government in disposing of the equipment, should receive the equipment on a consignment basis, and give customary guarantees therefor. It is indicated that prices should be around 75 per cent of replacement cost, or at the cost reported by the owning agency. Improved products should be allowed to compete with surpluses, with revisions downward for used equipment. Trade discount policies are recommended, but where instruments are required for training, these should be priced low—but not less than 10 per cent of cost. Sufficient quantities of these planes should be placed with dealers so that purchasers may be able to depend upon adequate "servicing."

For Class E planes (unabsorbed surpluses) the most important use is education and ground training. The committee recommends the sale or donation, rather than loaning, of such planes to educational institutions; sales at nominal prices on a single price policy being preferable. These aircraft would not be used for flight. Transfers for memorial purposes also are recommended. The transfers of Class E equipment for experimental use also is advocated, and it is urged that every avenue for non-flight use should be explored. The committee recommends that unabsorbed surplus aircraft (Class E) should be stripped of salable items and of strategic materials. It is suggested that RFC study the possibility of having aircraft manufacturers undertake this job. When no ultimate use of Class E surplus can be found, it is recommended that scrapping should be done at current scrap prices, and that no accumulation should be permitted for longer than six months after property has been transferred to Class E.

Daimler Armored Car

(*Continued from page* 34)

of the lever. The handle of the lever is so designed that pressure on it in a forward direction trips the pawl, enabling the brakes to be moved to the "off" position by the recoil springs.

The duplicated steering is arranged as follows: From the driver's steering wheel a universally jointed shaft, inclined at normal steering column angle, runs down to a box containing two pairs of bevel gears, whence a lateral shaft runs from one pair of bevels to the steering gear-box. The horizontal "drop lever" is linked to the front wheels in a more or less conventional manner where independent springing is provided. From the second pair of bevel gears a jointed shaft runs back along the floor to the bottom of a vertical shaft with bevel gears at bottom and top, those at the top being at the rear end of a short horizontal shaft carrying the commander's steering wheel inside the turret. This wheel operates normally as regards direction of rotation; i.e., it is turned clockwise to steer the vehicle to the left while running backwards, and vice versa. Besides the steering, the commander has a hand throttle, hand brake lever and ignition switch, but no means of changing gear, which process must be done by the driver receiving instructions from the commander. This shortcoming is, however, appreciably counteracted by the fluid flywheel transmission and the pre-selective gears.

A Body Interior you can Wash!

If you could find a better looking body interior that could be washed as easily as the exterior of the car, restored again and again for life to perfect freshness and cleanliness—would that be something you would want for your after-the-war car?

You can have such an interior; it is ready for you. Formica decorative sheet in smooth satiny surfaces, or embossed and figured patterns, in the widest variety of colors and effects is available which can be installed by the same methods you are using now.

There are no serious problems of design and production to solve. Everything is ready to go, now! So this much of the car of the future you can deliver on your first After-the-war models.
Let Formica engineers give you the facts.

ARMY E NAVY

FORMICA

THE FORMICA INSULATION COMPANY
4612 SPRING GROVE AVENUE CINCINNATI, O.

War Production Will Increase

(*Continued from page* 46)

the war to the unconditional surrender of the enemy.

Pontiac Motors Div. of G.M. also is in production of 155 mm shells. In less than a month, the company got into production using converted machinery formerly used for production of 75 mm shells. The machines required new tool blocks, rebored spindles and chucks, and general reconditioning. Other G.M. divisions participating in the 155 mm shell program are Fisher Body at Grand Rapids, which is retooling for production, and the Oldsmobile plant at Lansing, which has been engaged in shell manufacture for some time. Willys-Overland Motors, Inc., Toledo, a producer of six-inch shells since 1941, has received a big addition to its original order for 155 mm projectiles. The company has turned out more than 2 million high explosive and smoke shells to date. Also, Willys has just received three new contracts for approximately 5000 gasoline tanks and about 1000 vertical stabilizers for the Curtiss C-46 Commando and an undisclosed number of carburetor air intakes for the SC2C Hell Diver.

Dodge Div. of Chrysler Corp. has revealed that it has almost doubled production of parts for the Navy's Bofors 40 mm antiaircraft gun as a result of recent schedule changes. Production time has been reduced 52 per cent since the original estimate in 1941.

Chevrolet Div. of G.M. now is in production of 18-cylinder Pratt & Whitney aircraft engines for the Army Air Forces. Assembly is at the Buffalo, N. Y., plant with 16 other plants acting as suppliers of parts. The first test run of the engine was made five months and 18 days after the commitment was made to the company. Current production of Pratt & Whitney 14-cylinder engines, which Chevrolet has been building for two years, will be maintained. Despite retooling and rearrangement of plant facilities for production of the large model, output of the 14-cylinder engine has been held at a high rate.

Revision of "Little Steel Formula"

(*Continued from page* 46)

the landing mat program, which is expected to expand. There are reports that sheet output will be facilitated by a tapering off in the requirements for tin plate as well as from a cutback in steel plate output during the year's last quarter. For what reports of some steel mill order books being filled way into 1945 are worth under the strict CMP controls, they are interesting because they reflect a high degree of confidence that, come what may, 1945 will continued to be a banner year for steel demand. To what extent the possibly large scale distribution of war surpluses will affect this, remains to be seen, but even the most conservative observers appear not to be greatly worried on that score.

At meetings held in August in various cities, Arizona's smaller copper mine owners met to discuss a proposed bill to provide federal mine developing and maintenance funds, which Senator James G. Shrugham of Nevada, chairman of the Mining and Minerals subcommittee of the Senate Small Business Committee, is sponsoring. Commenting on reports of copper scarcity in the United States, "The Metal Bulletin" of London said in a recent issue: "We have always found it a little difficult to believe that America could be seriously short of copper when she commanded supplies of fully 2,000,000 short tons a year, but so far government stockpiles of the metal have never reached particularly high figures in relation to consumption" and adds significantly: "It may be that America is nearing the phase which this country seems already to have reached, of having adequate supplies of war materials on hand, so that production can be slowed down until a fresh survey of future requirements can be made in the light of developments in the fighting zones."

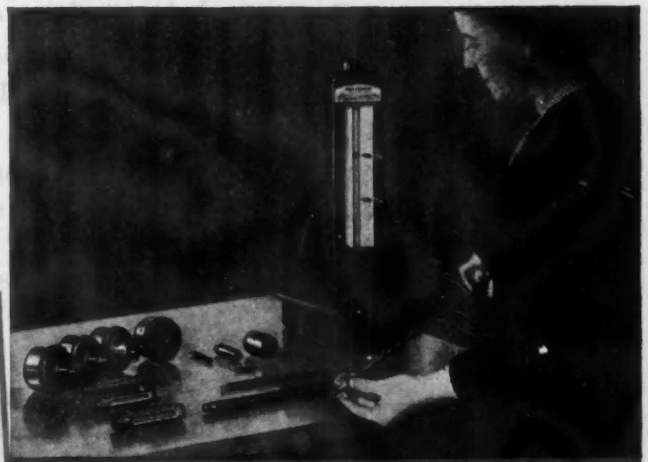
Now—for the first time—standardized air gage spindles and components for checking long, short, through or blind holes at the gage or remotely at the machine or bench. *You can write your own specs!*

No more engineering time and charges! Deliveries shortened to a matter of days. Interchangeability of spindles and components enables adoption of complete air gaging program at minimum cost and minimum gage inventory.

No more GO and NO GO checking of internal diameters. Both tolerance limits are checked in one pass faster than either could be checked with a plug gage. Frequent, time-consuming and therefore costly, inspections of gages are eliminated.

Precisionaire spindles outlast plug gages 10 to 40 times.

No more human element of error when you use the Precisionaire. Parts with tolerances ranging from .005" to fractions of .0001" can be checked quickly by unskilled and untrained operators who merely present the gage to the part or vice versa.



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MACHINE TOOLS • GAGES • MEASURING INSTRUMENTS • CONTRACT SERVICES

WRITE for Engineering Data No. 12 detailing STANDARDS and also showing SPECIAL applications.

Smoothness of External Surfaces

(*Continued from page* 19)

it is necessary to make use of hydro press forming for reasons of economy, it will be necessary to utilize wiper plates or draw plates and to form parts in the as-quenched condition or from the ice boxes.

Parts having a shallow recessed contour, which are normally formed by drop hammering in the SO condition, heat treated and re-hit in the same die, will not possess the required smoothness of contour, since the re-hit will not completely remove heat-treat distortion. This class of parts should utilize two-stage hammer dies or starter and finish dies. These dies should be constructed so that the first operation die has a contour at least ⅛ in. shallower than the finished contour. This will allow the finish operation to move the material sufficiently to give a permanent set and to remove heat-treat distortion. Close conformance to contour will be necessary in the finish die.

Contoured skin panels, fairings, etc., which are commonly formed into female dies with rubber, heat treated, and re-hit in a drop hammer or in the same dies as the first operation, will not possess the required smoothness of contour. Parts of this nature should utilize stretch-press forming and be produced from ST or as-quenched material.

Riveting

Probably one of the greatest offenders where local "canning" or denting is concerned is existing hand riveting practice. Considerable research has been done by the NACA and other organizations to achieve tighter riveted joints, and one of the techniques developed, illustrated in Figs. 2, 3 and 4, has possibilities for application where surface smoothness is required. The procedure is as follows:

A. Use AN 430 AD rivets.

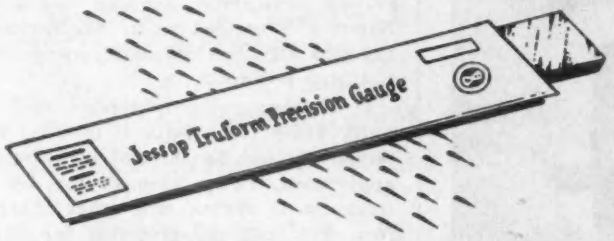
B. Drill the same as for the conventional method of riveting.

C. Machine countersink the outside surface to 60 degrees included angle by 0.050 in. deep for ⅛ or 5/32 in. rivets when the outer skin is 0.040 in. or thicker. Investigations indicate that the countersink and depth are not critical for either strength or tightness.

D. Buck shank into countersink with a flat bar and apply gun to round head, using a round set. Gun and bucking bar may be reversed, if necessary, for access, but this makes it more difficult to set the rivet. The only limit on the size of the bucked head is that it cover the countersunk area. The head should not be flattened any further than necessary, as this may cause sheet separation. Due to the gun pressure, any riveting by this method with skin gages of .051 in. or less will cause canning of the skin. Spring loaded tools will

JESSOP

Precision Gauge for UNIFORMITY... CONVENIENCE



FOR CONVENIENCE each piece of Precision Gauge is oiled and individually packed in envelopes. The size and heat treatment is clearly marked on each envelope, allowing the worker to readily identify the steel. This procedure assures that each piece will be dust free, unscratched and free from rust and other harmful matter.

SPECIFICATIONS: Finished ground on all dimensions to a thickness tolerance of .001". Sizes range from 1/64" to 1" in thickness and 1/2" to 6" in width and stocked in 18" lengths. Furnished in annealed condition.

QUALITY and uniformity of precision products are assured when Jessop Precision Gauge is used because it will not warp or shrink during heat treatment. It is ideally suited for applications requiring two flat parallel surfaces, and its use eliminates the practice of machining from bar stock thus affording the machinist or die maker an opportunity for doubling his production. Jessop Precision Gauge is made from superior quality electric furnace tool steel that has been properly processed and annealed. Typical applications include Flat Gauges, Test Gauges, Machine Parts, Pawls and Shims, Fixtures, Jigs, Keys, Parallels, Die Work, Straight Edges, Levers, Punch Dies, Templates, etc. Available for delivery from warehouse stocks.

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JESSOP STEEL COMPANY

HEAD OFFICE AND WORKS: **WASHINGTON, PENNA.**

Established 1901

have to be developed for thin gage applications.

E. The rivet length is approximately 3/16 in. more than the total sheet thickness for ⅛ or 5/32 in. rivets. The rivet should be as long as can be driven without clinching, as this will eliminate possible sheet separation.

F. Mill off the bucked head of the rivet flush with the skin. A special milling tool, described in NACA Bulletins No. 13, A Flush Rivet Milling Tool, June, 1942, and No. 44, An Improved Flush Rivet Milling Tool, May, 1943, is used for this operation.

G. Buff or polish riveted area as may be required to obtain the proper degree of smoothness.

Spotwelding

The indentations left by spotwelding electrodes on Zone 1 surfaces will not be acceptable. This precludes the use of ordinary tip welding on such items as wing leading edges. It requires the use of large flat electrodes with the accompanying problems of proper maintenance and cleaning of tips. The sort of tooling in Fig. 5 must be used, which means a greater outlay.

Organic Finishes

The easiest approach to the surface smoothness problem at first glance appears to be through the liberal use of organic surfacers and paints, depending upon these materials to fill up all dents and cracks. However, the ordinary surfacers are compounded of heavy materials, and too liberal a use of them would inflict a severe weight penalty. Some weight can be allowed for this finish, however, and the following illustrates a technique which is reasonable if the proper benefits are obtained:

A. The surfaces must be free from grit, dirt and metal shavings. The shop coat of zinc chromate primer must be touched up in places where it has been removed as by machining rivets, etc.

B. Surfacer is applied to all areas with a pressure spray gun. For seams less than 0.032 in. or rivet identations, surfacer can be applied with a putty knife or several heavy spray coats applied in the seams only.

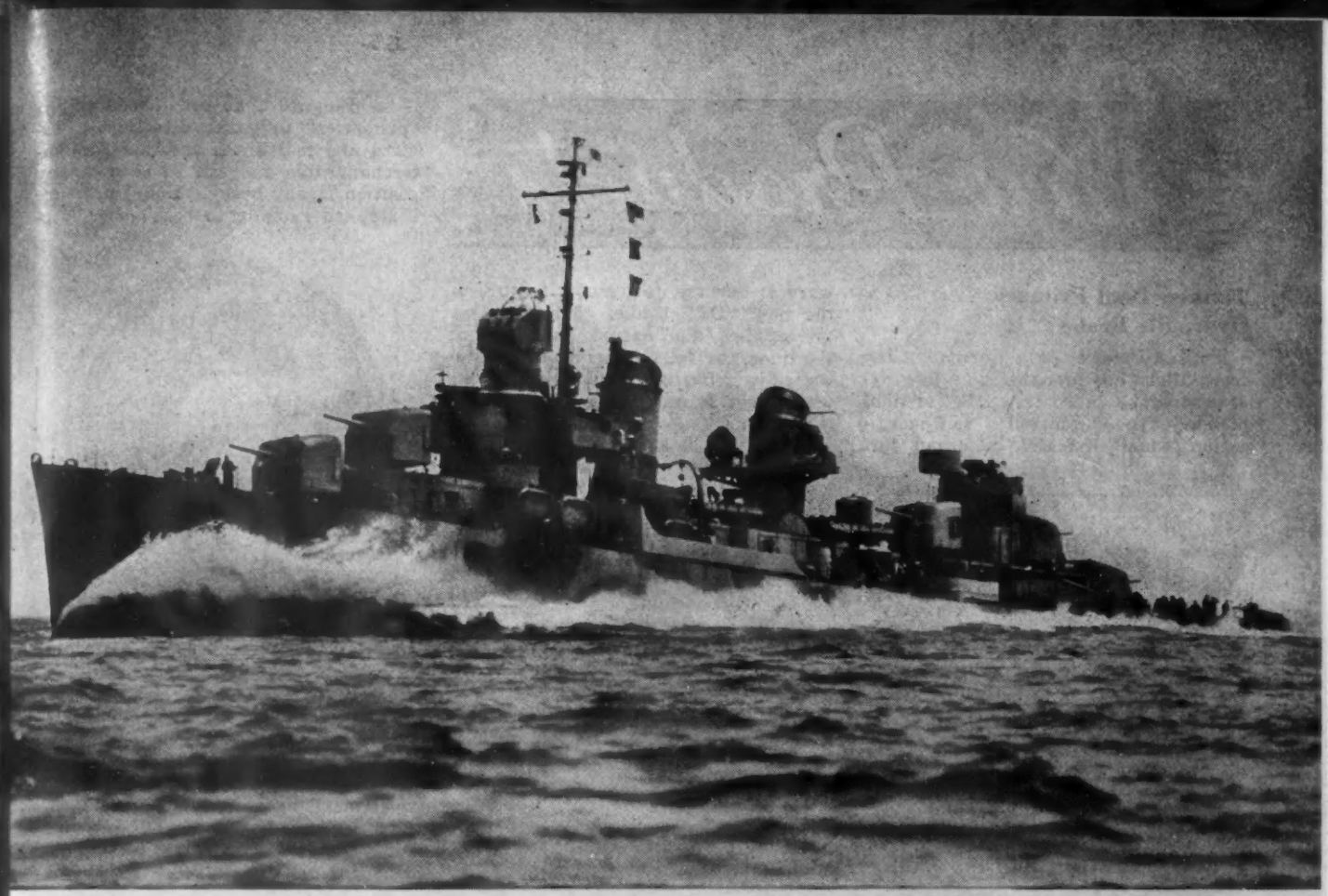
C. Sanding is done either by hand or an air-driven sanding machine. Sanding is carried on in circular motions to hit high spots and avoid cutting into low spots.

D. Glazing putty is applied with a putty knife. The putty is used as received but can be thinned for ease of application. Putty, when drying, has a tendency to shrink and crack; therefore it is not recommended for gaps greater than 0.064 in., as vibration of the surface will cause it to fail. For the majority of seams, surfacer unreduced is preferred, as the shrinkage is less and the durability better.

E. Two coats of lacquer are applied by means of a spray gun after all sanding is completed. The speed of painting shall be such as not to have sags or runs in the film. A coat of lacquer thinner is then applied approximately five minutes after the second coat of lacquer. In cases where some foreign matter or grit gets on the lacquer and causes irregularities, these areas can be sanded smooth with No. 320 sandpaper after the lacquer has dried, and then retouched.

Automobile Old Timers to Award Citations

Several well known pioneers of the automobile world will receive Distinguished Service Citations at the, Fifth Annual Meeting of the Automobile Old Timers, Inc., to be held on October 18. At a recent meeting of the organization's Committee on Research and Awards, it was unanimously voted to present awards to the following: Lieut. General William S. Knudsen, Washington, D. C.; Charles E. Sorensen, Toledo, Ohio; Charles (Henry) Davis, Bass River, Cape Cod, Mass.; Hurlbut W. Smith, Syracuse, N. Y.; James T. Sullivan, Boston, Mass.



A TRIBUTE TO THE BATH IRON WORKS

from the makers of **PENNSALT CLEANERS**

REG. U. S. PAT. OFF.

● The first ship built in America, the "Virginia," was launched from the shores of the Kennebec in 1607. The Bath Iron Works Corporation is carrying on the tradition of the Kennebec today, launching destroyers like the one above. At its present rate of production, B.I.W. produces in one year more than twice as many of these ships as were launched by them during the entire World War I. Our hats are off to the men and women who have made possible this enviable record.

How fine these ships are is well expressed in the following extract from a letter written by the commanding officer of the destroyer pictured above:

"A word of praise for the grand job the Bath Iron Works did on the ship. She has been through h—l and high water and never failed us. Keep on building ships as fine as this . . . We have put on nearly one hundred and fifty thousand miles and she is as good as new."

We of Penn Salt are proud of the small part we are privileged to play in this outstanding achievement.

Galvanized work on these ships is first cleaned with a Pennsalt Cleaner to insure a finish which will withstand the extreme corrosive conditions of the sea.

Paint stripping is another important use of Pennsalt Cleaners at the B.I.W. In fact there is a Pennsalt Cleaner scientifically designed for nearly every type of metal and maintenance cleaning.

Our chemical engineers will be glad to demonstrate the benefits of Pennsalt Cleaners to you in your plant. No obligation. Write fully to our Special Chemicals Division, Dept. AA

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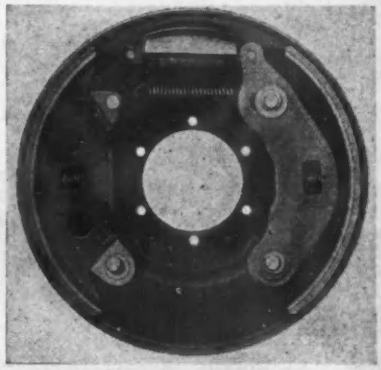
New Products

Timken Dual Primary Hydraulic Brake

Timken-Detroit Axle Company, Detroit, Mich., has brought out a new hydraulic brake called the "DP," or dual primary type. Controlled self-energization, equally effective in either forward or reverse, is a major feature of the new "DP" brake. When brakes are applied, the natural tendency of the shoes to follow the drum is prevented by self-aligning abutment blocks which bear against the angled ends of the shoes.

Of the two-shoe type, the "DP" brake is so designed that both shoes act as "primaries" in either direction. Forward and rear shoes are therefore interchangeable and can be used in any position in any brake. Equal pressure is applied radialiy to both shoes, permitting the use of a straight bore wheel cylinder with interchangeable pistons, cups and seals on both sides. Braking ability is said to be increased 30 to 35 per cent throughout the range of accepted hydraulic line pressures.



Hydraulic brake made by Timken-Detroit Axle Co.

Water-Resisting Hand Protective Cream

A water-resisting hand protective cream for workers whose jobs bring them into contact with water-soluble cutting oils, dilute acids, alkalies and other water-chemical mixtures, is a recent development of E. I. du Pont de Nemours and Company, Wilmington, Del.

Known as "Pro-Tek No. 2" hand-protective cream, it is a companion to the original "Pro-Tek," a greaseless product which protects against paints, lacquers, grime, grease and insoluble cutting oils. The new cream is intended for operations where water is present and the standard water-soluble "Pro-Tek" unsuitable. An advantage of "Pro-Tek No. 2" is that it protects against a number of chemicals, and thus eliminates the necessity of separate creams for each particular need.

High-Speed Copper Plating Process

An improved high-speed copper plating process which reduces operating costs and speeds up production rates is announced by E. I. du Pont de Nemours & Company, Wilmington, Del.

This improvement is a development of the copper-plating process introduced by the Electroplating Division of the company in 1938. The original method plated heavier deposits of copper in a shorter time than had before been possible. It utilized a carefully compounded and controlled sodium copper cyanide bath operating at 100 per

cent current efficiency and at increased current densities.

The new gains were achieved by working out a method of substituting potassium cyanide and other potassium salts for the sodium salts formerly used with still further increases in current densities. Development of methods for producing the potassium salts in this country, and technical advances in their use in plating baths, made the substitution possible.

Wide Base Tire Rim

The Goodyear Tire & Rubber Co., Akron, Ohio, has released information on a new, wide base rim, combining all the features of the present standard rim base with a side ring that increases rim width.

Tires mounted on the wide rims do not generate as much heat in the shoulder of the tire as do tires mounted on narrow rims and the average amount of deflection under load and in motion is reduced by 12½ per cent when ratio of rim width to that of tire

Goodyear tire rim

sectional diameter is increased from 60 to 70 per cent. The wider rim also adds to the stability of the tire, reducing sway and giving a more positive steering response.

As shown in the accompanying illustration, the increased width is obtained through use of the new type side ring which generally adds a half inch or more to the rim width.

An additional feature of the new type rim is the tapered seat under both beads. This centers the beads and decreases chafing and bead failure.

Liquid Resin Glue Sets at Room Temperature

The Casein Company of America, New York, N. Y., is introducing a new synthetic resin glue which sets at ordinary room temperature. It is named Cascophen RS-216 liquid resin glue and is used with a separate dry powder catalyst.

It is claimed that Cascophen RS-216 can be stored indefinitely at room temperature. It cures in 8 to 10 hours at 70 F, or in less time at higher temperatures. The bond meets the most rigorous joint tests required by any current U. S. Government specifications.

New Exide Storage Battery

The Electric Storage Battery Company, Philadelphia, Pa., has made available the new Exide-Powerclad battery. This new Exide supplements

AEROSCREW

THREADED TAPER PINS,
DRILLED HEAD BOLTS,
HEXAGON HEAD BOLTS, ROD ENDS,
CLEVIS BOLTS *and* PINS,
FILLISTER *and* WASHER HEAD SCREWS,
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AERO SCREW COMPANY
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the production of Exide-Ironclads to relieve shortages. It is said to meet the most exacting requirements encountered in motive power service.

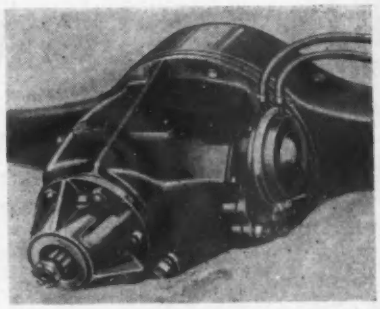
The Powerclad embodies an exclusive design of the positive assembly. It is a plate completely enclosed by a slotted polystyrene retainer. In combination with the separators, it assures effective retention of the active material, and provides rapid diffusion of the electrolyte.

The maker states that the many exclusive features of this newest Exide combine to produce a motive power battery that provides maximum capacity in minimum space consistent with the fundamental requirement of long life expectancy in order to assure economical operation.

Two-Speed Axle Power Shifting Mechanism

Announcement is made by The Timken-Detroit Axle Company, Detroit, Mich., of a new 2-speed axle power-shifting mechanism called the Easy Power Shift, available as a built-in feature with new Timken 2-speed double reduction axles.

Either fast or slow axle ratio may be pre-selected while running under torque load in the other. The shift is completed without delay as soon as the driver releases the foot throttle momentarily. Axle gear shifting can be accomplished just as readily when using engine compression as a brake on long down grades, as when pulling a full load. Power for "cold" shifting is ample.



Two-speed Timken axle with Easy Power Shift

Power for shifting axle ratios is furnished by a vacuum power chamber built into the axle. Double vacuum lines connect the power chamber with the selector valve on the dash. Vacuum supply may be direct from the engine manifold or from the vacuum brake system, and a reserve vacuum tank may be installed if desired.

Vacuum power unit of the Timken Easy Power Shift, on light and medium duty axles, is mounted parallel with the axle housing. On larger axles the power shift unit is front-mounted, to avoid frame interference, and operates through a bell-crank inside the housing.

All moving parts of the Timken Easy Power Shift, including the entire shifting mechanism, are fully enclosed, and no lubrication is required.

New Products Announced by Consolidated-Vultee

Consolidated Vultee Aircraft Corporation, San Diego, Cal., is using a new thermo-setting plastic, called "toolite," in fabricating form blocks, dies, drill jigs and fixtures. Compressive strength of the plastic is said to range from 10,000 psi to 20,000 psi. It can be cast within 1/32 in. of finished size, and can be machined with the same facility as hard wood.

Another Consolidated Vultee development is a sort of glue, named "metlbond," which is said to have unusual adhesive qualities. Metlbond may be used to bond plexiglas to aluminum, steel to plastics, aluminum to steel, and glass to glass. Metlbond may be used also with magnesium, zinc, cadmium, fiberglas, cotton, rayon, wood and rubber.

New Aluminum Alloy has High Tensile Strength

The Aluminum Company of America, Pittsburgh, Pa., is now producing an aircraft aluminum alloy, 75S, which

(*Turn to page* 192, *please*)

MOISTURE *means Life to Flowers*

NOX-RUST NO. 310-AC

The Master Rust Preventive

PROVIDES DUAL PROTECTION AT LOW COST

Does two things economically and with complete effectiveness: NOX-RUST NO. 310-AC prevents the formation of rust in between operation periods of machinery. That's because it definitely displaces moisture from the metal surfaces where NOX-RUST has been applied. Stands constantly on guard against the rust that would otherwise form when metals "sweat." And, secondly, NOX-RUST NO. 310-AC removes contaminants —fingerprints or water or any other foreign matter on the metal's surfaces. No rust shows up overnight where NOX-RUST NO. 310-AC is on guard; nor on stock in storage. Try It in YOUR Plant!

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Yesterday—*Only true pioneers and thrill seekers would ride in the rickety "egg crate" plane. Yet that plane, with all its crudities, was a giant step in human progress and transportation. Without early abrading, processes such as grinding, it would have been impossible.*

Today—The giant air liner is a tremendous improvement on the plane of yesterday—as is the modern fighter or bomber over the planes of World War I. HONING—the advanced abrading process—helped to make this improvement possible. Safety, lightness, long operation without overhaul—all are dependent to some degree on HONING.

Tomorrow—We do not know what course the progress of air transport will take. But whatever it is, there will be greater need for better controlled machining processes.

Micromatic has developed the HONE ABRADING process to be ready for these advanced requirements. At present, HONING application is limited to serious war needs. Tomorrow, it can expand with many new applications already developed.

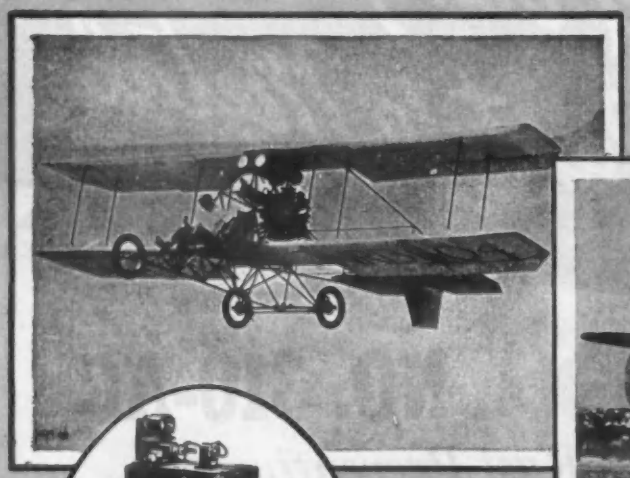
HONING

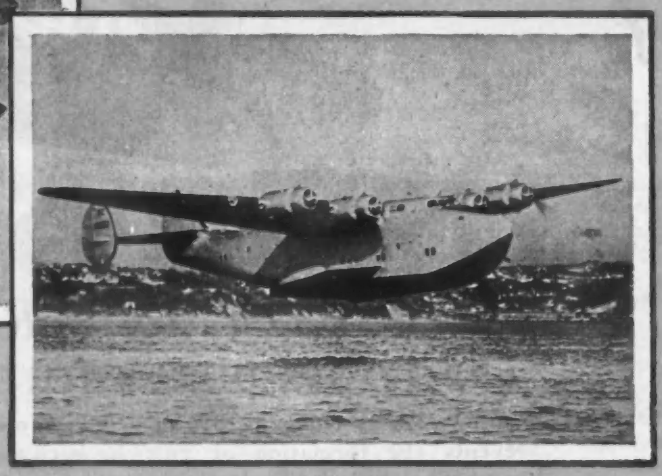
helped to develop yesterday's

"EGG CRATE" Plane

into the

SAFE, MODERN AIR TRANSPORT





Micromatic HONE CORPORATION

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HONING helped create "400" Aviation

The tactical need for outflying our enemy has crowded military aviation into the "400" bracket, as may be seen in the comparison below:

	WORLD WAR I	WORLD WAR II
Speed	130 MPH	400 MPH
Period Between Engine Overhauls	40 Hours	400 Hours
Tactical Ceiling	12,000 Feet	40,000 Feet
Engine HP	125 HP (Liberty)	2,000 HP

This amazing advancement has been accomplished largely by better engineering design, better metallurgy and better controlled machining. Microhoning provides one of the most important machining controls by assuring maximum quality and safety in the bearing surfaces of our military and naval plane engines and other plane mechanisms.

Bearing bores and other critical surfaces are finished by Microhoning—the modern abrading process which removes stock at rates up to 65 cubic inches per hour, generates accuracy for roundness and straightness of bore within .0002″ to .0003″ and any desired surface finish.

Better planes for war mean better planes for the peace to come.

Some Microhoned Aircraft Bores

Engine Cylinder Barrels
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Articulated Rod (all bores)
Piston Pin Bores
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Pinion Gear Bores
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Brake Cylinder Bores
Gun Turret Hydraulic Cylinder Bores and many other parts

MICRO MATIC

MICROMATIC HONE CORPORATION

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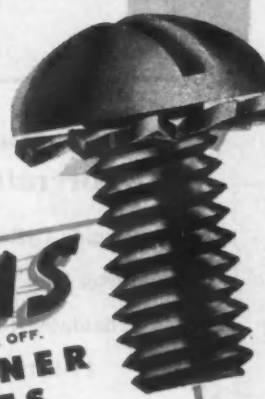
WHY doesn't someone tell her BOSS?

Dropping lock washers wastes time!



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FASTENER UNITS

- Lock Washer Can't Drop Off!
- No Lost or Wasted Lock Washers!
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- Saves Time—Speeds Assembly!
- Worker Can't Forget the Lock Washer!

WRITE TODAY FOR FREE TEST KIT NO. 23!

LET SHAKEPROOF ENGINEERS HELP YOU SPEED ASSEMBLY WITH MODERN FASTENING TECHNIQUES!

Dropping lock washers—and picking them up—is a real time waster! But this is just *one* assembly line problem that can be solved through the use of Sems Fastener Units. Sems provides a Shakeproof Lock Washer and Screw pre-assembled and delivered as a single unit, thereby making the entire fastening operation faster and more efficient with the assurance of locked-tight parts.

By analyzing your fastening applications, Shakeproof Engineers can help you eliminate *many* time-wasting assembly operations. The proven results of this service definitely show substantial reductions in production time and costs. Ask to have a Shakeproof Engineer call immediately. Write today!

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Plants at Chicago and Elgin, Illinois
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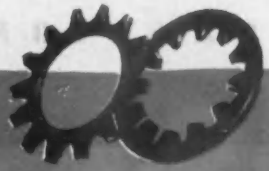


Shakeproof Lock Washers with Exclusive Tapered-Twisted Teeth

Shakeproof Type 1 Thread-Cutting Screws for Metals

Shakeproof Type 25 Thread-Cutting Screws for Plastics

Shakeproof Cowl Fasteners . . . "The Quick Opening Lock"

A Partial List of Industries for Which Presstite has Successfully Developed Special Sealing Compounds:

For the Aircraft Industry:
Sealers for—
- Integral Fuel Tanks
- Fuselage Seams
- Drop-off, Expendable Fuel Tanks
- Gun Turrets
- Synthetic Glass
- Instruments
- Intercoolers
- Air Ducts
- Insulating Dissimilar Metals
- Seaplane Floats

For the Refrigeration Industry:
- Sealers for Domestic and Commercial Refrigerators
- Bonding and Sealing Low Temperature Insulation in Refrigerated Rooms

For the Railroads:
- Sealers for Insulating, Soundproofing, and Weatherproofing of Railway Cars — Sealing Car Windows and Spot Welded Seams

For the Building Industry:
- Roof Coatings, Caulking, and Waterproofing Compounds

For the Shipbuilding Industry:
- Insulation Adhesive and Sealers — Rust Preventive Compounds

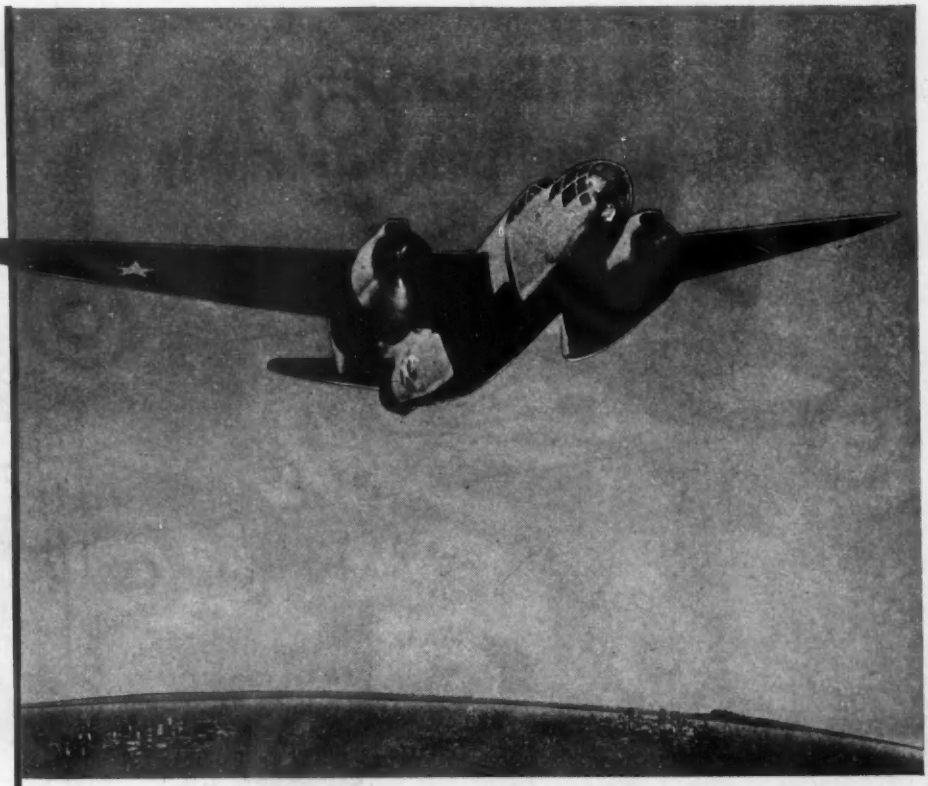
For the Automotive Industry:
- Special Adhesives and Sealers

For the Construction Industry:
- Sealers for Jointing Sewer Pipes
- Sealers for Waterproofing Excavation Work

Miscellaneous:
- For Glazing Greenhouse Windows
- Extruded Caulking Compounds
- Ammunition Paints
- Plus Many Special Products for the Army and Navy

Our Engineering, Technical, and Laboratory facilities are at the service of any industry with a sealing problem.

PRESSTITE
SEALING COMPOUNDS



VISION UNLIMITED!

Presstite Sealing Compounds are playing an important part in America's production of military and naval aircraft. Yet it was the vision of our research and engineering staffs, aided by years of previous industrial experience, that enabled Presstite to meet the emergency demands of the aircraft industry in time of war.

From sealers used by the refrigeration and construction industries, by the railroads, and in many other fields, Presstite engineers developed special sealing compounds that today speed the assembly and contribute to the safety and efficiency of America's air armada.

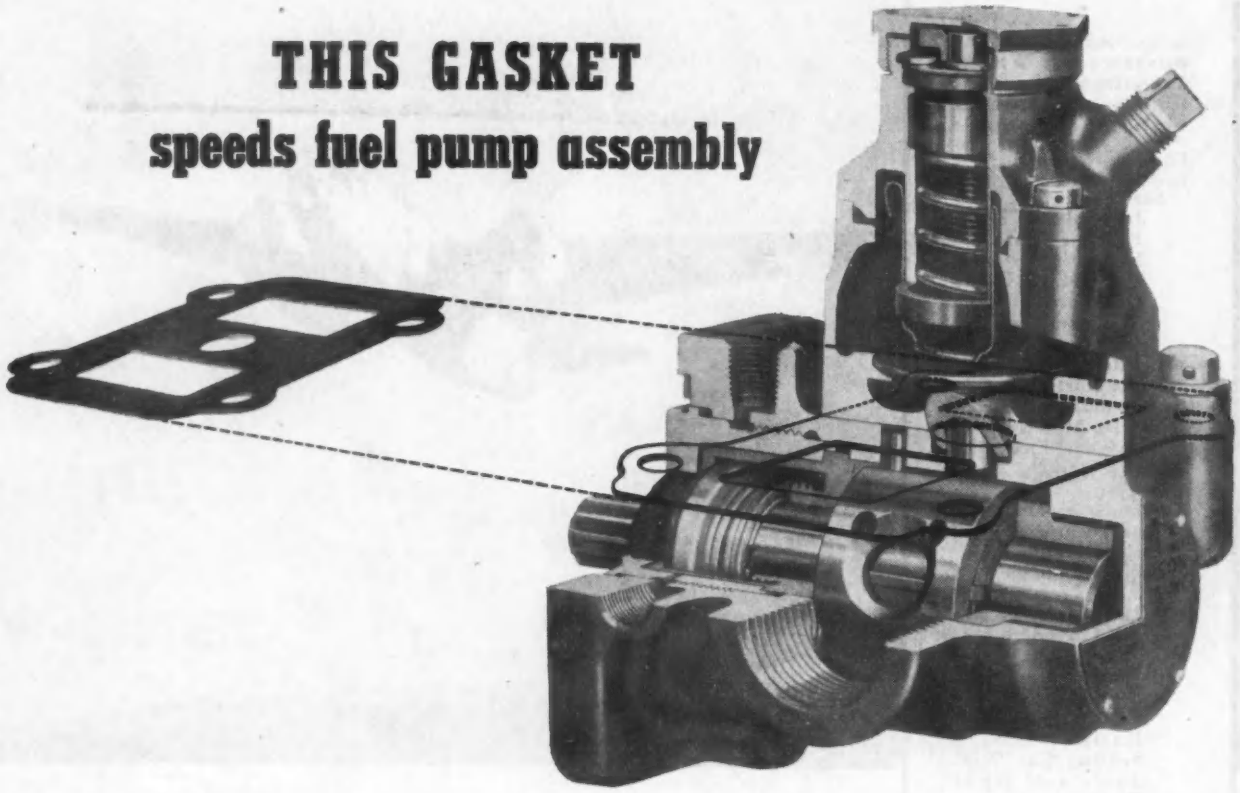
Not only are Presstite sealers being used to seal aircraft fuel tanks, fuselage seams, gun turrets, seaplane floats, pressurized cabins, and other vital parts and devices, but we are producing many special compounds for the U. S. Ordnance Department, the Engineers Corps, and the U. S. Navy.

"*Ceiling Unlimited*" is the pilot's signal that the far horizons of the sky are visible in every direction. "*Vision Unlimited*" is symbolic of the continuing forward progress of Presstite engineering and research.

Today, and in tomorrow's post-war era, the vision unlimited of the Presstite organization stands ready to serve American industry wherever the most effective sealing compounds are required. We'll gladly work with you and your engineers, if you'll send us your detailed requirements.

PRESSTITE ENGINEERING COMPANY, 3926 Chouteau Avenue, St. Louis, Missouri

THIS GASKET
speeds fuel pump assembly



BECAUSE it is truly compressible—does not side-flow under pressure, the Armstrong's Gasket shown above facilitates the assembly of aircraft fuel pumps. A sure seal is obtained without equalizing the tension on each flange bolt—a time-consuming necessity with the noncompressible gasket previously used in the pump illustrated.

This highly compressible Armstrong's Gasket is die-cut from a cork-and-synthetic-rubber material—one of a group of Armstrong's Compositions that withstand the attack of aromatic fuel. Because it has been so successful in speeding assembly and in providing a leakproof joint every time, the fuel pump manufacturer has standardized on gaskets of the same material for other types of equipment.

There are more than fifty Armstrong's Sealing Materials with the right compressibility and other properties for specific applications. These materials are available in roll goods, ribbon, and tapes . . . in sheets and strips . . . and in die-cut parts, extruded rings, and molded pieces.

Seals are only one of many Armstrong's products that are helping automotive and aviation engineers solve performance and production problems. See the list below—then send for free samples and technical data about those that interest you. Write to the Armstrong Cork Company, Industrial Division, 1508 Arch St., Lancaster, Pennsylvania.

ARMSTRONG CORK COMPANY

MATERIALS AND SPECIALTIES FOR AIRCRAFT AND AUTOMOTIVE UNITS

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- **Composition roll goods,** with or without fabric back, plain or adhesive-coated—used as glazing strip, binding tape, cushion pads, anti-skid flooring, and gaskets
- **Tank strap cushions**
- **Sealing materials** for specialized aircraft equipment handling aromatic fuel
- **Felts** for vibration-damping and soundproofing
- **Wingwalk materials**
- **Resilient floorings**
- **Carburetor floats** and other fabricated natural or composition cork specialties

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A Tested Source for the MASS PRODUCTION of Small Precision Parts

Right now Wadsworth is making small precision parts for forty-five major companies which normally manufacture such products as radio equipment, refrigerators, automotive parts, precision instruments . . .

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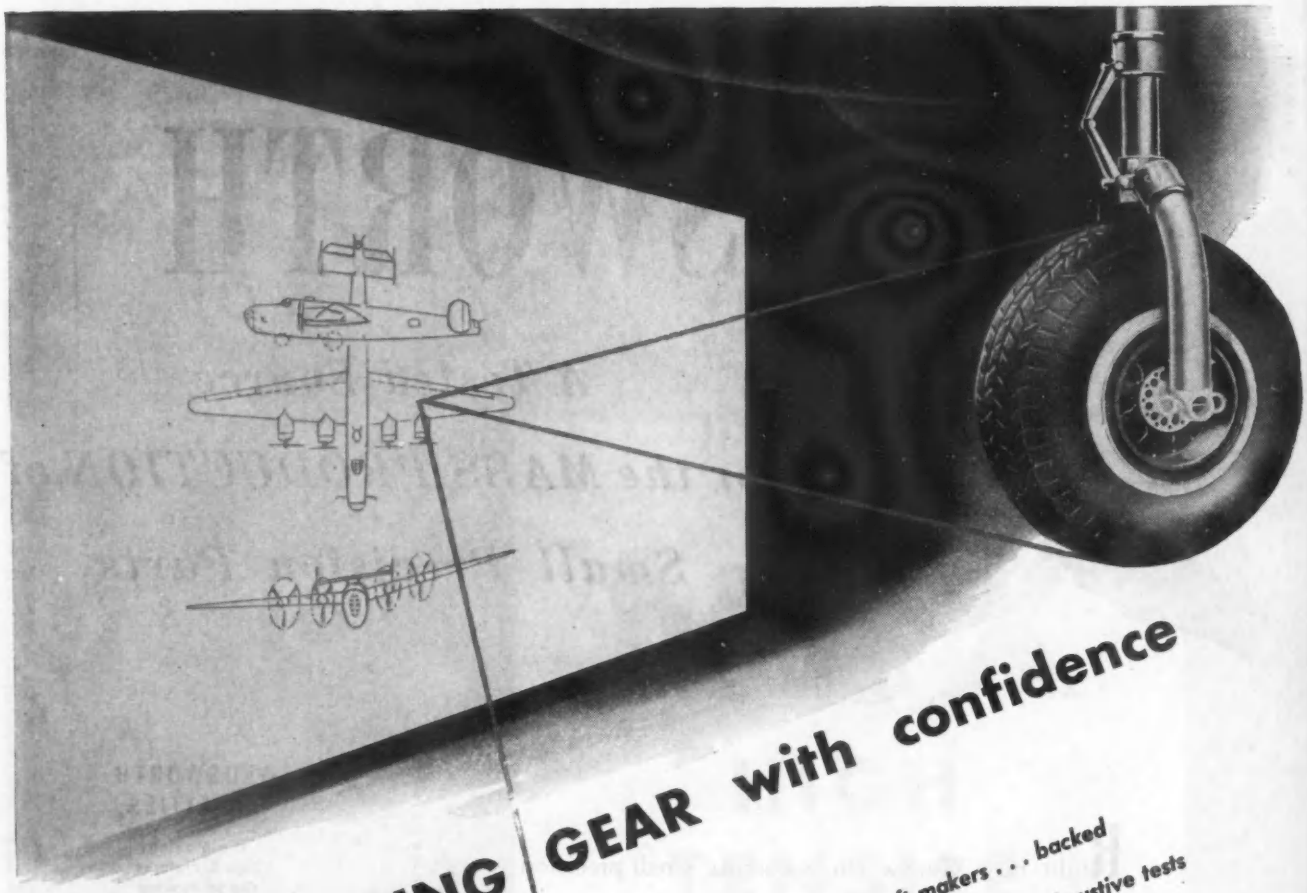

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Preferred by leading aircraft makers . . . backed by unparalleled facilities . . . proven in exhaustive tests . . . engineered to meet your specific requirements.

You're safe, you're *sure*, when you specify Bendix Landing Gear equipment, because we've made it our business to make certain it's *right* before it ever leaves the factory. Every Bendix Landing Gear part goes through the toughest tests science has devised. A giant 30-ton dynamometer checks the stopping power of the brakes at all landing speeds. Massive drop-testing machines assure an ample margin of safety against landing shocks. Struts are wrenched, twisted, tortured to make sure they'll stand the gaff . . . make sure they'll more than measure up to all requirements.

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FOR COLOR APPEAL...

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Nitrocellulose lacquers are ideal finishes for all types of metal. Easy to apply, they add brilliant color, full gloss, and beauty.

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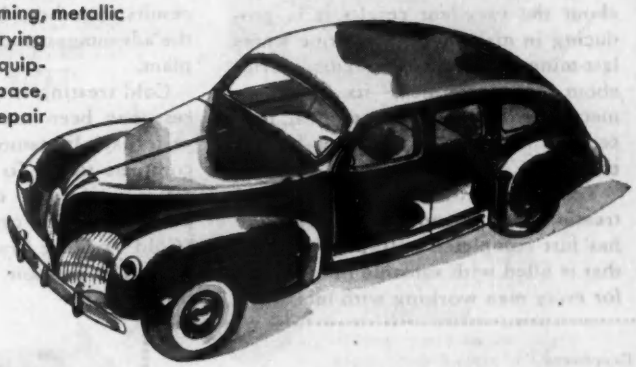
No other finish has the same range of beautiful, delicate pastels; rich, bright opaques; gleaming, metallic iridescents. Fastest-drying finish known—saves equipment, labor, plant space, maintenance and repair costs.



CL-47

Hercules makes no finished lacquers, but supplies the nitrocellulose from which lacquers are made. For helpful application information on your finishing problem, *call your lacquer supplier*. Cellulose Products Department, Hercules Powder Company, 959 Market St., Wilmington 99, Delaware.

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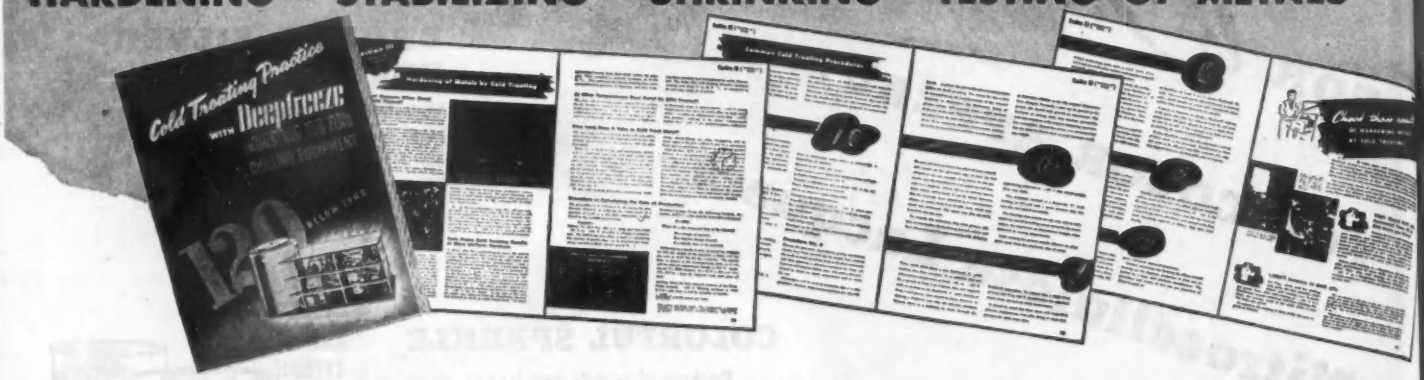

Actual Experiences Point the Way to Effective Use of Cold Treatment *in Your shop*

Sub-zero treatment of metals is being employed in more industrial applications every day. Men who aren't already using this effective process have read about the excellent results it is producing in many fields. Everyone wants last-minute information and discoveries about cold treatment—its effect on metals, fields where it is practical, procedures for treating different metals, etc.

To bring you the latest authentic cold treating practices and data, Deepfreeze has just completed a 40-page booklet that is filled with valuable information for every man working with metals.

This new FREE book explains what actually occurs when metal is subjected to chilling, and how the changes that take place are adaptable to a wide range of industrial applications.

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Your best bet for AC Welding is a "Bumblebee"

with a *Stinger that Penetrates*

Every feature of design and construction, both inside and outside the sturdy case of the Wilson "Bumblebee", has been planned to give the utmost in efficient, dependable and economical service:

1. *Precise, Stepless Adjustment of Welding Current* to any value within NEMA range, provided by easy-turning crank.
2. *Efficient Ventilation* by motor-driven fan assures safe, dependable operation, even when welding with maximum current.
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4. *Coils Protected Against Fire and Vermin* by mica and glass fabric insulation.
5. *Interchangeable Primary Terminals* permit easy, rapid change from low to high line voltage or vice versa.
6. *Output or Secondary Terminals Readily Accessible* by removing 4 screws which hold small insulating panel.
7. *High Visibility of Current Indicator* is assured by large, easily read calibrated scale located outside case.

These features are incorporated in every "Bumblebee" welder—either regular or all-weather model. "Bumblebee" welders are also performing a valuable service as a power source for automatic welding heads.

In addition, the "Bumblebee" offers all the advantages of AC welding:

- —Low Maintenance because of absence of moving parts
- —Low Power Costs because of high electrical efficiency
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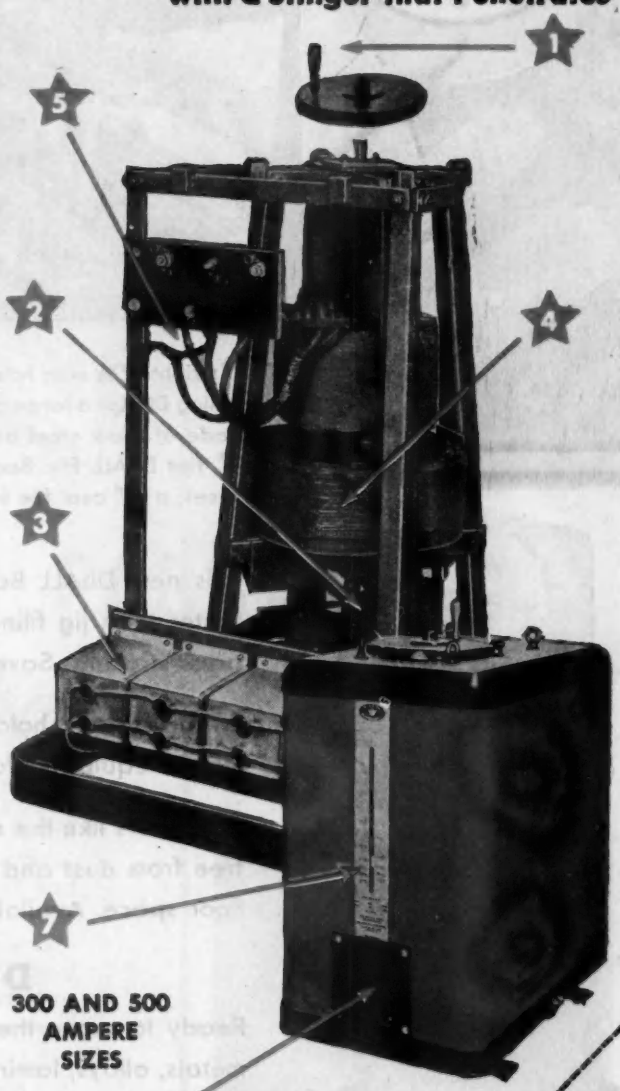
- —Improved Quality of Welds

—at no greater first cost than other types of welding equipment.

Other AC welders in 100, 200, 750, 1000 ampere sizes.

Mail the coupon today for new catalog—or write to your nearest Airco office.



300 AND 500 AMPERE SIZES

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Please send to me by return mail a copy of the "Bumblebee" AC Machine Catalog (ADW-53).

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Company.....

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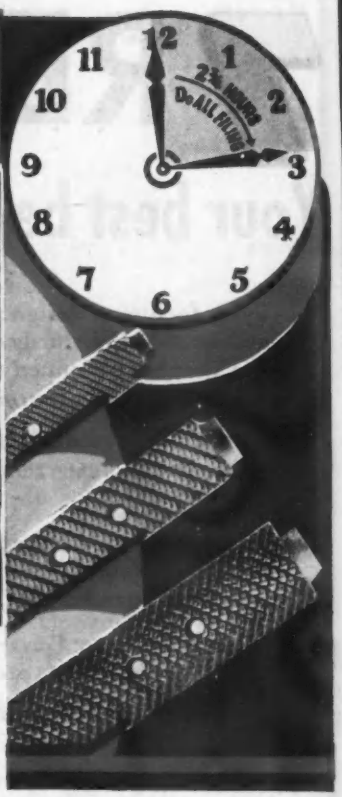
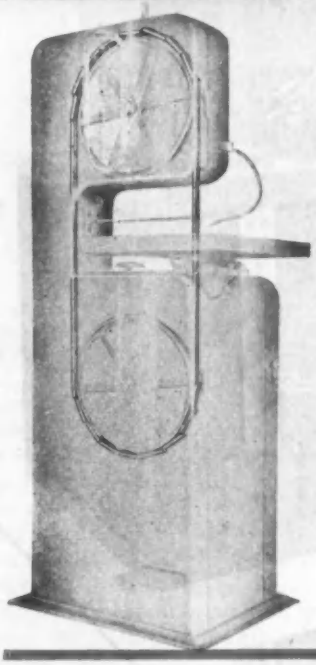
10 HOUR JOB IN 2¾ HOURS *with* DoALL BAND FILER



That's right! 7¼ man hours were saved on each Pierce Punching Die for a large aircraft manufacturer. This die is made of plow steel and measures 16 x 15 x 3/16". A ½" flat DoALL File Band was used for the straight surfaces, a ½" oval file for the large radii.



This new DoALL Band Filer is 9 times faster than hand filing—4 times faster than jig filing. Gives you smooth, steady, one-way filing, without back stroking. Saves time, metal and file bands.

Strong support holds file band firm and means more even cutting. Speedmaster equipped for variable speed, 50 to 250 f.p.m.

Operators like the roomy, tilting work table and the air jet which keeps it free from dust and chips. Weighs 485 pounds. Occupies only 27 x 34" floor space. Available on M.R.O. priority.

DoALL FILE BANDS

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for Aircraft Parts

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Applied to plane parts and weapons by spraying, swabbing, or dipping—depending on type—this "liquid packaging" eliminates the risk of rust and corrosion from factory to battle-line . . . is easily, quickly removed —*if* removal is required.

Your inquiries about these protective compounds will receive prompt attention. Our engineers are ready to work with your engineers in designing special chemical products to meet your particular needs. *R. M. Hollingshead Corporation, Camden, N. J.; Toronto, Canada.*

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(For aircraft engines and parts)

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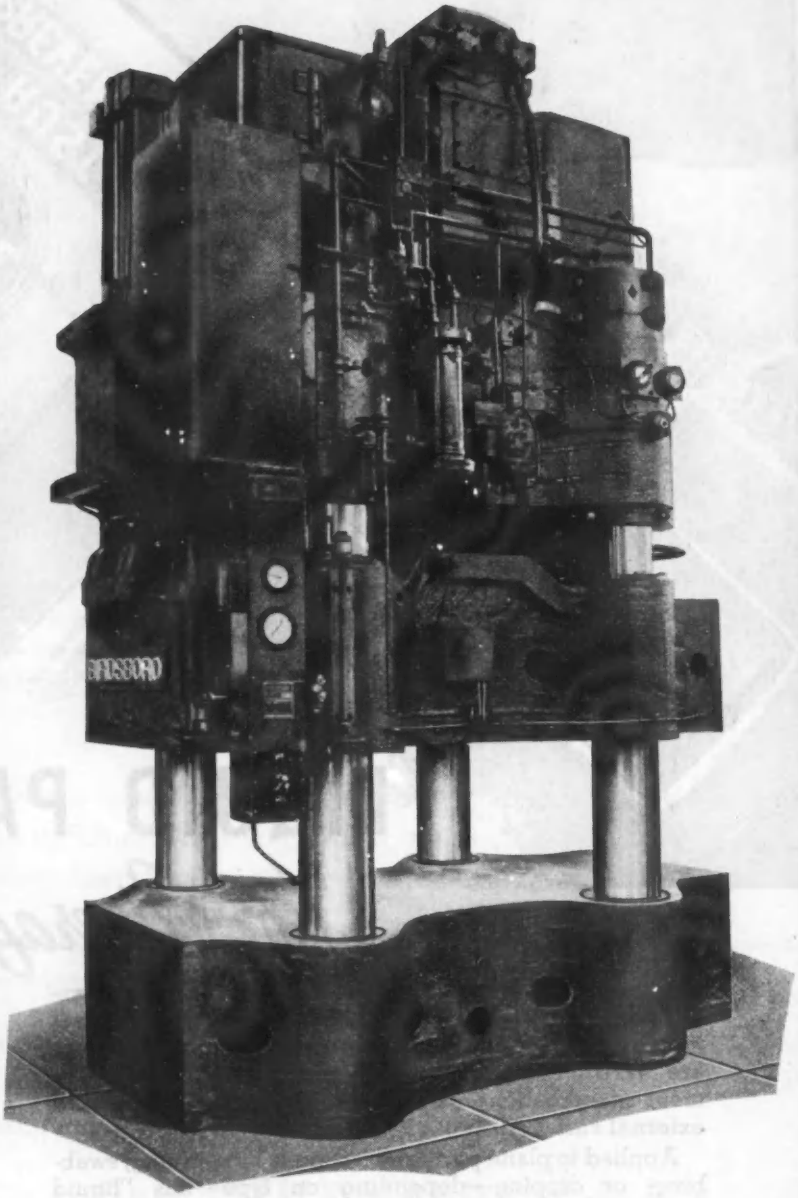

Day and night eleven 2000-ton Birdsboro Hydraulic Presses of this type are at work in the Curtiss-Wright propeller manufacturing plant at Caldwell, New Jersey and Beaver, Pa., producing precision-formed electric propellers for America's air armada.

Throughout the entire aircraft industry today, Birdsboro Hydraulic Presses are doing big jobs, and doing them well. Production and management men alike realize when it's a press problem, it PAYS to ask Birdsboro.

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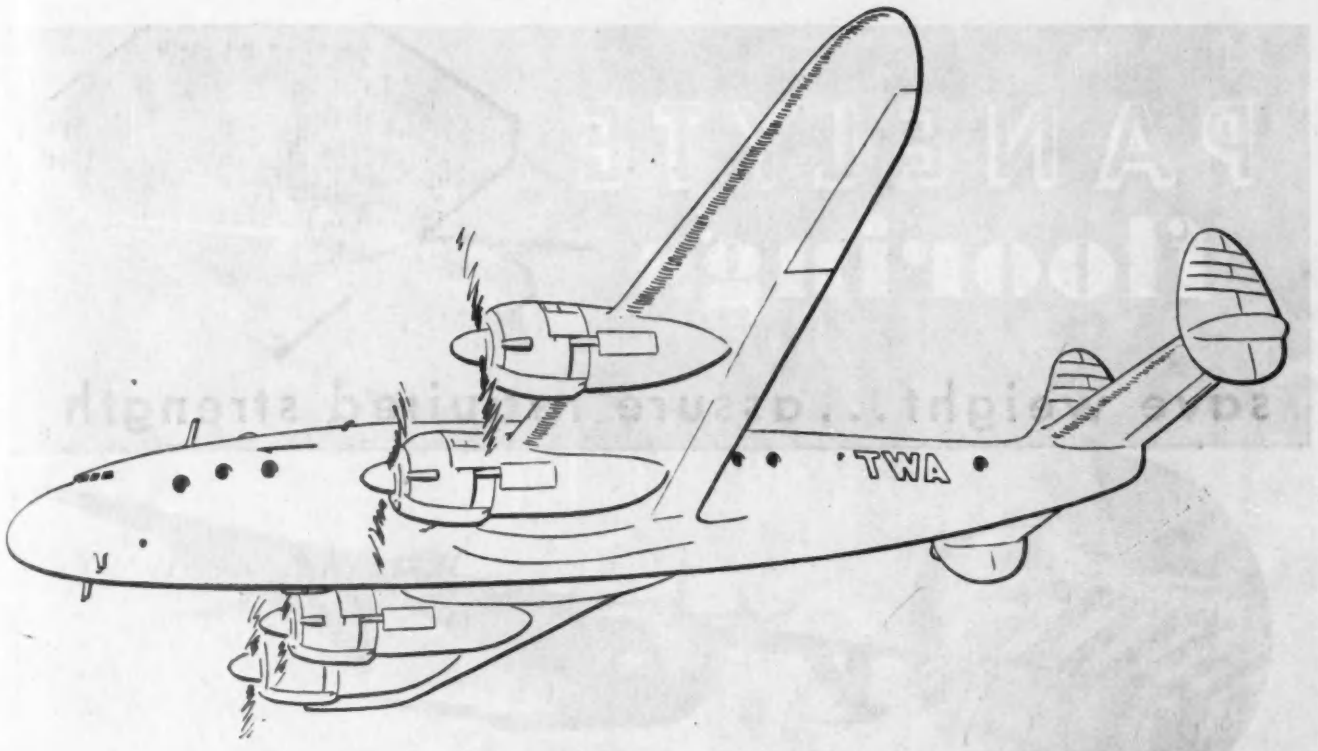

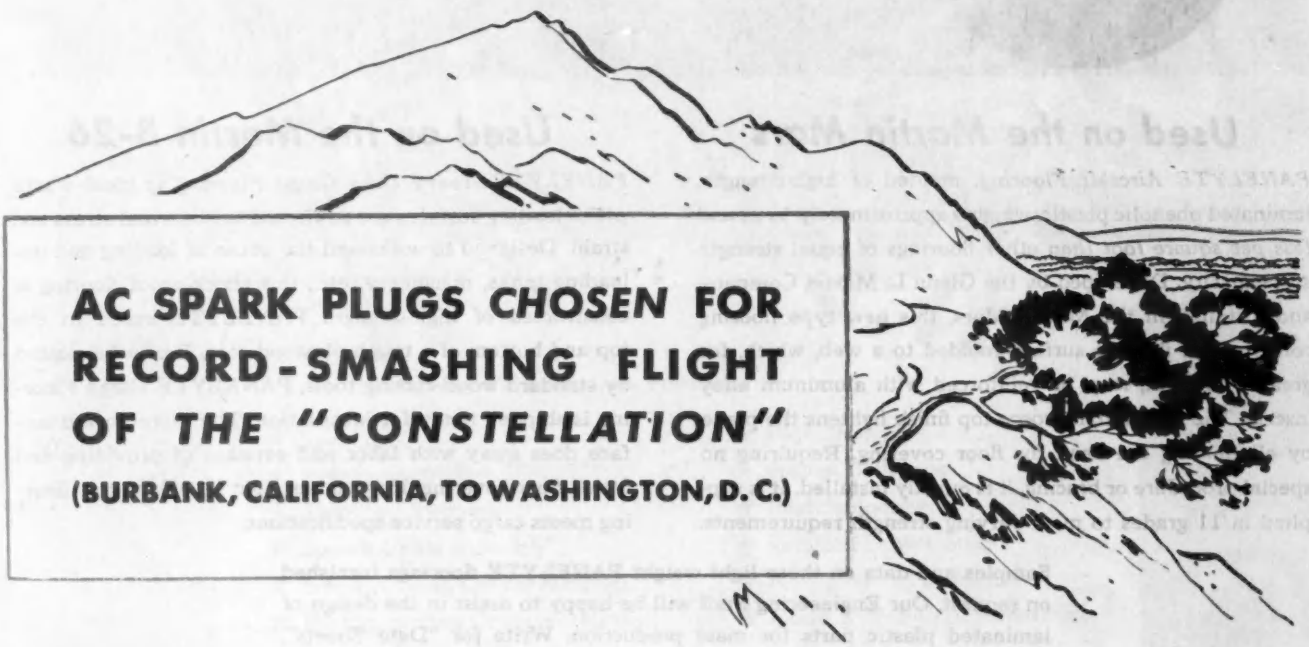

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(BURBANK, CALIFORNIA, TO WASHINGTON, D. C.)

On April 17, the world's largest land-based transport plane,—TWA's 40-ton Lockheed-built "Constellation,"—shattered every transcontinental speed record for big planes by completing the coast-to-coast run in 6 hours, 58 minutes.

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BUY THAT EXTRA WAR BOND THIS MONTH

AC SPARK PLUG DIVISION • GENERAL MOTORS CORPORATION

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save weight...assure required strength

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PANELYTE Aircraft Flooring, molded of high-strength, laminated phenolic plastic, weights approximately *¼ pound less per square foot than* other floorings of equal strength and capacity. Developed by the Glenn L. Martin Company and installed in the Martin Mars, this new type flooring consists of a flat top surface molded to a web, which, for greater strength, may be reinforced with aluminum alloy inserts. The non-skid, morocco top finish lightens the plane by eliminating the need for floor covering. Requiring no special procedure or bracing, it is quickly installed. It is supplied in 11 grades to meet varying strength requirements.

Used on the Martin B-26

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Samples and data on these light weight PANELYTE floorings furnished on request. Our Engineering Staff will be happy to assist in the design of laminated plastic parts for mass production. Write for "Data Sheets".

PANELYTE *the structural plastic*

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- Can be used over and over again.
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- Now used on *every* type of military aircraft.
- Will be standard on commercial planes after Victory.
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(W6S 8-32) The comparable fibre-collar nut is 96.4% heavier than this all-metal self-locking steel nut.

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Courtesy
Allison Engineering Co.

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GRINDING

The complex contours between the blades of the part shown above illustrate what can be accomplished in one operation by Formed Wheel Grinding.

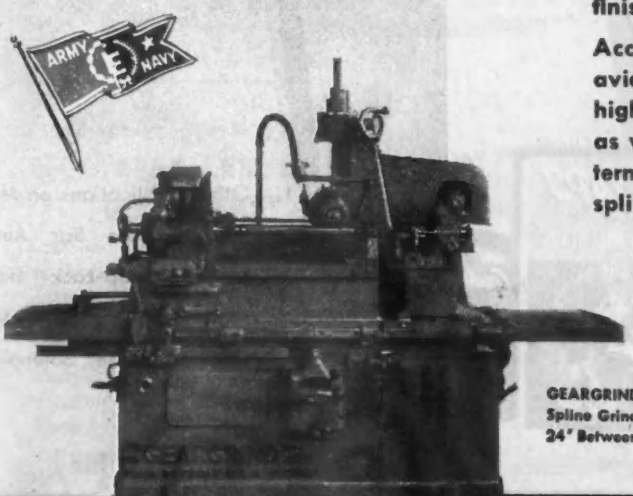
Each blade consists of two intersecting straight sides joined to the convex root radius by a fillet.

To finish these blades a GEARGRIND Spline Grinder, Type SG-11 is used. The grinding wheel is dressed to the required contour as illustrated above. One operation finishes both blades, root fillets and root diameter.

Accuracy is held within the limits required by America's aviation engineers. Finish is excellent. Production is high. Investigate GEARGRIND Machines for special jobs, as well as for their recognized function of producing external and internal gears, external and internal involute splines, straight splines, serrations and racks.

CATALOG ON REQUEST

We are in position to design and build special machines for special jobs where Formed Wheel Grinding answers the need for production, accuracy and finish.



GEARGRIND Type SG-11 Spline Grinding Machine 24" Between Centers

The GEAR GRINDING MACHINE COMPANY
DETROIT 11, MICH. U.S.A.

Manufacturers of the RZEPPA Constant Velocity Universal Joint.

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When you reconvert it will be your decision —what you will make, and *when* you will make it.

But it may be our privilege to help you with the HOW. And what is more vital, to help you answer the question, "How much will it cost?"

Here are several National Acme Publications designed to help you produce *more for less.*

Write us—on your company letterhead—for any of them.

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"Multiple Spindle Chucking Automatics"

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CATALOG D-42-B
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Other Publications on Multiple Spindle Bar Automatics, Snap-Lock Limit, Motor Starter and Station Control Switches, Solenoids, Centrifuges.

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At your Service . . .

ALLEGHENY LUDLUM'S FILM LIBRARY

Instructional films on tool and stainless steels—some in full color, all with sound—available for free showings by companies, trade & industrial groups, student training courses, technical schools and colleges, etc., upon request.

WRITE FOR DETAILS

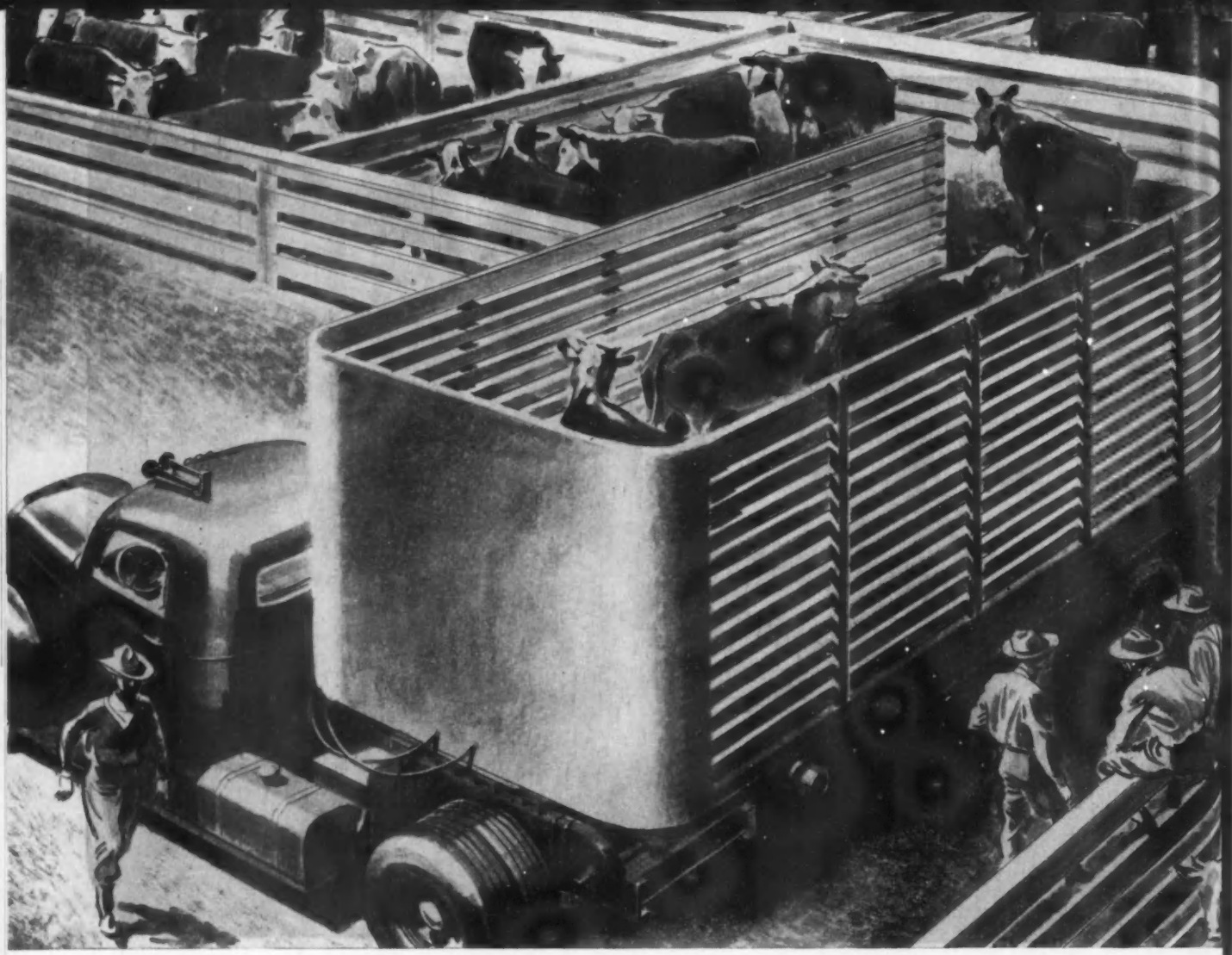
ADDRESS DEPT. AI-24

A GREAT many companies—yours probably included—already have a clear idea what item those new blueprints will cover. One thing's sure: whether your future products stay in familiar fields or enter new markets, they'll have to be as modern and value-packed as your engineers can make them. Improved design, and the use of better materials, are the means to the end.

You'll find a lot of your "better materials" answers among the various Allegheny Ludlum families of special, high-alloy steels. If you're looking for such qualities as improved electrical characteristics, finer appearance, greater strength, resistance to heat, wear or corrosion, etc., we have the design and production data you need. Let our Technical Staff help with your plans.

Allegheny Ludlum
STEEL CORPORATION
GENERAL OFFICES: BRACKENRIDGE, PENNA.

W&D . . . B-9330



RATION POINTS IN THE ROUGH MUST ROLL

Bendix-Westinghouse salutes those intrepid owners and operators of Motor Transport Equipment who have done and are doing such a magnificent job in meeting the most complex food problem ever to face this nation ★ To those indefatigable maintenance crews, too, goes the plaudits of millions. But for their ingenuity Americans might have fared much worse on the "belt line" ★ Privileged to serve with the leaders in this industry, Bendix-Westinghouse is justly proud of the record its Air Brakes and Pneumatic Control Equipment has played ★ Wherever you are, whatever your business, the performance of genuine Bendix-Westinghouse Air Brakes have, through their war service alone, proven themselves indispensable to the modern way of transportation. Your nearest Distributor will be happy to tell you of the many exclusive advantages you can't afford to miss in the "Two greatest names in braking."

BENDIX-WESTINGHOUSE AUTOMOTIVE AIR BRAKE COMPANY . . . ELYRIA, OHIO

Bendix-Westinghouse

AIR BRAKES

AND PNEUMATIC CONTROL DEVICES

IT IS SIGNIFICANT THAT AMERICA'S FINEST MOTOR TRUCK FLEETS ARE EQUIPPED WITH BENDIX-WESTINGHOUSE AIR BRAKES

Let's DO SOME POSTWAR PLANNING WITH BOTH FEET ON THE GROUND

IT'S all right to talk about new plastic refrigerators—glass ranges—"miracle" homes with solar heat—visionary automobiles made of magical new materials by revolutionary manufacturing methods—but, if buyers have to wait months, maybe years for such products, the manufacturers are not going to hear that merry tinkle in the till for some time to come.

The immediate demand will be for products that have acceptance—in all probability the old standbys of your pre-war product line with new improvements to be sure—products you know will give customers satisfaction—products that will give you low selling cost, low service cost with quick turnover and profits.

So we submit that wise postwar planning should prompt you to go through two stages—

Get into production on essentially those products you've sold or made before—improve, but be careful of radical changes.

Bring along those revolutionary new developments as quickly as they can be "proved."

It is wise to remember that products that are "coming" ring no bell including the one on the cash register, until they arrive. The products you made and sold in the past gave mighty good customer satisfaction and performance. To help meet the immediate postwar demand, what would be more sensible than to offer your customers and prospects good, proven products—*fast!*

We hope you'll agree with this outline of our thinking. We call it *"Postwar planning with both feet on the ground."*

Since industrial progress has always been evolutionary . . . *never revolutionary*, it is only to be expected that the experience you have gained in working to military requirements of precision will have a permanent effect on your postwar product development and manufacturing methods. This is something to remember for when competition really becomes tough, the highest standards of quality will be imposed on every type of product—utmost production efficiency will be imperative for profitable operations.

If your present or contemplated production operations involve the high precision finishing of metals, wood, plastic or new alloys—let McAleer make those operations profitable. During this war we have been privileged to help many manufacturers solve the varied and complex problems involved in the hypercritical finishing of many kinds of high precision war equipment. These same companies, we feel, will turn naturally to McAleer for the answer to their postwar product finishing needs. We want you to feel free to do the same.

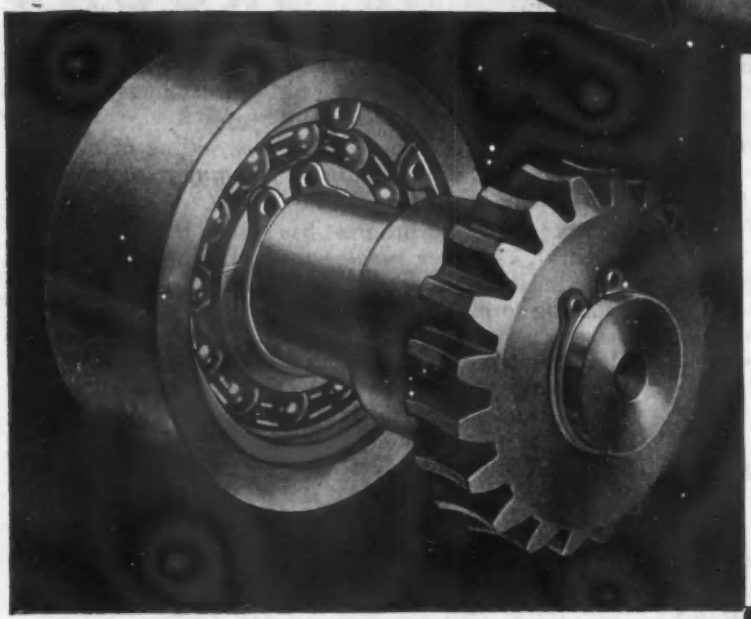
McAleer MANUFACTURING CO.

Manufacturers of Quality-Controlled Finishing Materials, Military Aircraft Sub-assemblies and Pyrotechnics . . .

ROCHESTER, MICHIGAN

WALDES TRUARC RETAINING RING

U. S. Patent Re. 18144
Sole Manufacturers in U.S.A.



For thrust-load fixing, and shaft and housing applications, Waldes Truarc provides distinct advantages over nuts and bolts or wedges and washers... it reduces dimension and weight... saves material... cuts manufacturing time... simplifies assembly and dis-assembly.

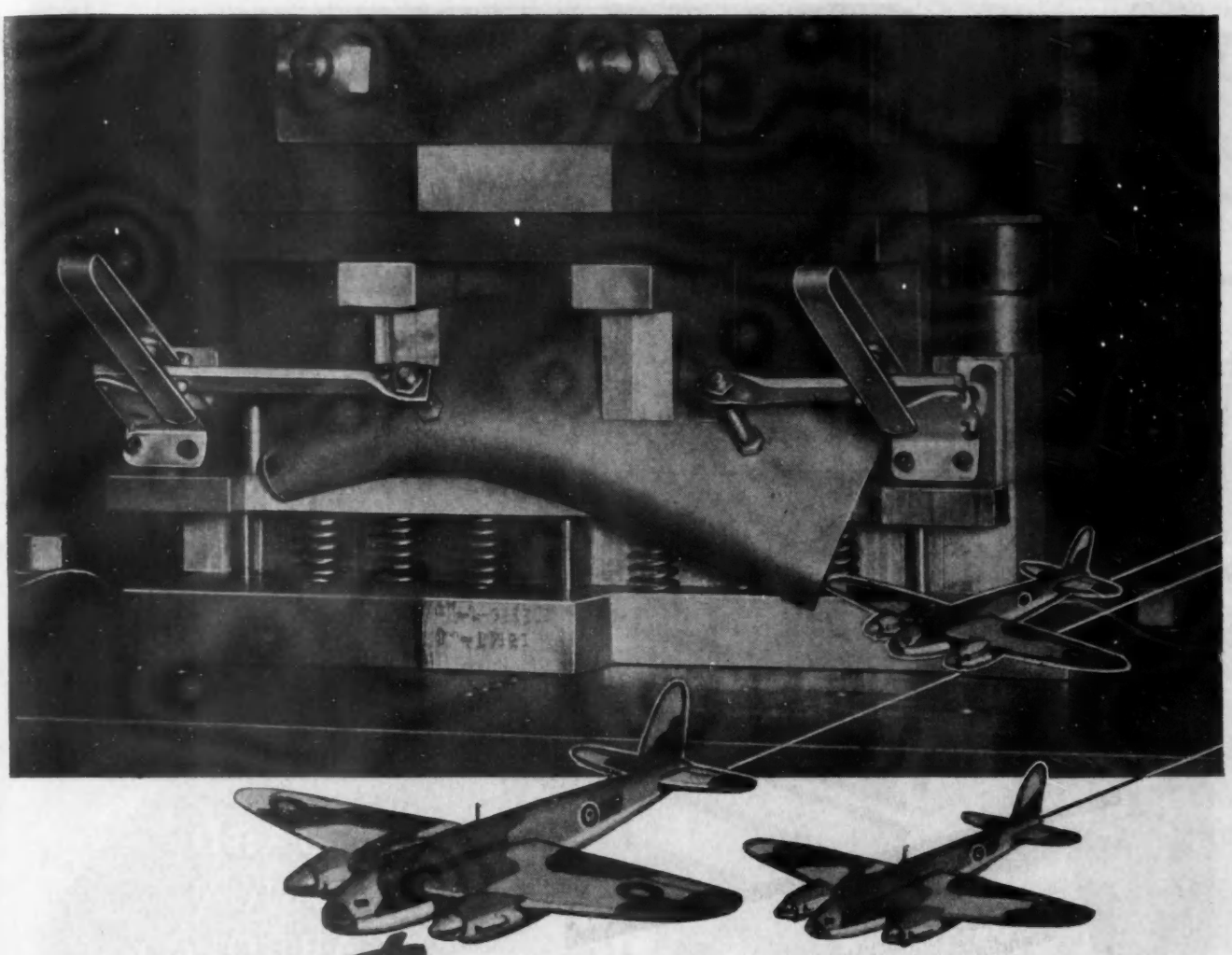
On request, we will gladly furnish samples and full data for your tests.

● Waldes Truarc presents a significant advance in retaining rings.

It spreads or contracts without distortion, always retaining its perfectly fitting circular contour.

WALDES KOH • I • NOOR • INC. ★ LONG ISLAND CITY, N. Y.

Canadian Representatives: Presco Progress Engineering Corporation, Ltd., 72-74 Stafford St., Toronto



Target Berlin

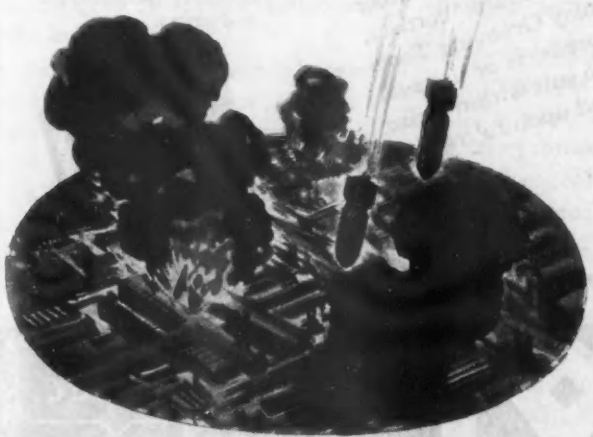
Danly Die Set

Die Springs	Stripper Bolts
Dowel Pins	Goose Neck Clamps
Kwik Klamps	Knurled Cap Screws

Are all in this picture, Target Berlin!

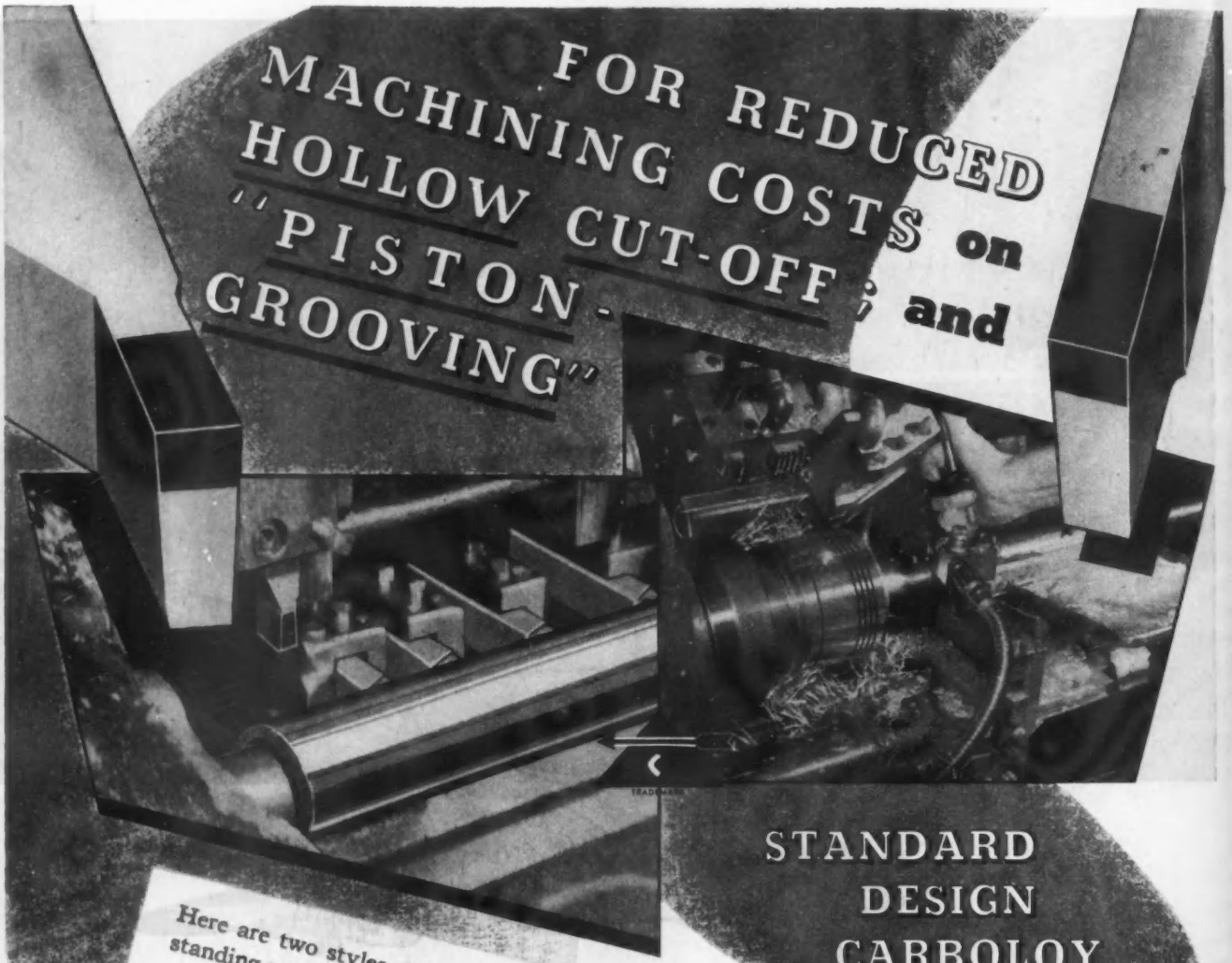
The famous British "Mosquito" bomber, that keeps Berlin awake on "quiet" nights, carries many parts made in Danly Die Sets.

Shown above is one of 8 dies that form and trim the exhaust pipes of this World's Fastest Bomber. Also shown is an interesting example of Danly Die Makers' Supplies, assembled with the die in a Danly Die Set. Easy for the die maker, tough on the Axis.



DANLY MACHINE SPECIALTIES, INC.
2100 South 52nd Avenue *Chicago 50, Illinois*

Danly Die Sets - Die Makers' Supplies



FOR REDUCED MACHINING COSTS on HOLLOW CUT-OFF and "PISTON-GROOVING"

STANDARD DESIGN CARBOLOY TOOLS

Here are two styles of standard-design Carboloy Tools producing outstanding results in two specialized fields of use:

1. Cut-Off Tools: Designed to give maximum tool life, good finish, at low tool cost per piece on all work requiring *cut-off to hollow cores. Widely used for cut-off operations on open ends of shell forgings. Available in 5 sizes starting at $\frac{5}{8}$" x $1\frac{1}{4}$".
2. "Piston-grooving" Tools: For the grooving of pistons and other parts where close tolerances, "mirror-finish", and "dead-sharp" corners, must be obtained. On such work the ability of Carboloy Grooving Tools to stand up for extra-long periods of use, at high speeds, is of unusual advantage. Available in standardized design, width to suit within a size range of .060" through .330", at established prices based upon tolerances of .002", .001" or .0004".

CARBOLOY COMPANY, INC.
Sole makers of the Carboloy brand of cemented carbides
11151 EAST 8 MILE STREET, DETROIT 32, MICHIGAN

Birmingham • Chicago • Cleveland • Los Angeles • Newark • Philadelphia • Pittsburgh • Seattle • Thomaston, Conn.
Also sold by 25 leading Mill Supply Distributors

Write for catalog GT-175 containing complete specifications and prices.

CARBOLOY ™

For Cutting CAST IRON and Non Ferrous Metals

For Cutting STEEL

TUNGSTEN CARBIDES ★★★ TUNGSTEN CARBIDES WITH TANTALUM AND/OR TITANIUM CARBIDES

Looks good . . . but will it run?

There was once a day when "Will it run?" was really a serious question in the minds of most prospective automobile buyers.

What has made the difference between those times and the recent years of big production, when assembly lines poured forth thousands of cars daily . . . all standardized down to the smallest part . . . all ready to start promptly, run smoothly and *keep on* running?

It has been the enthusiasm, the inventiveness, the drive, energy and ingenuity that has always marked the men of the automotive industry. It has been the urge for betterment that has inspired great engineering advances and startling improvements in production techniques.

And, contributing in no small measure, came precision building of automotive parts in quantity, so that each of many thousands of well-engineered interchangeable parts fitted exactly into its place and functioned exactly as it should.

Eaton engineers worked closely with the automotive engineers through this 30-year period of development—and helped to solve the many problems involved in producing *Quality in Quantity.*

Eaton and the automotive industry have continued to work together in meeting the tremendous and exacting demands of war production—and together they are looking forward to the day when this same teamwork can be applied to realizing the almost limitless possibilities of the world's peacetime future.

EATON

EATON MANUFACTURING COMPANY
General Offices: Cleveland, Ohio
PLANTS: CLEVELAND • DETROIT • SAGINAW
MARSHALL • BATTLE CREEK • VASSAR • MASSILLON

SUPPLIERS OF FINE PRECISION PARTS TO THE AUTOMOTIVE AND AIRCRAFT INDUSTRIES FOR MORE THAN THIRTY YEARS —NOW, AND TILL VICTORY IS WON, DEVOTING OUR ENTIRE FACILITIES AND RESOURCES TO WAR WORK.

This advertisement is one of a series which is appearing in national magazines and newspapers as Consolidated Vultee's contribution toward a clearer public understanding of transportation's role in the war, and its postwar opportunities and responsibilities.

Sulfa, Plasma—and Air

1. Since the start of the war, thousands of wounded Americans have been evacuated from battle zones by air. Said the Air Surgeon General's report: "The record places air evacuation in a group with the sulfa drugs and blood plasma as one of the three greatest lifesavers of modern military medicine."

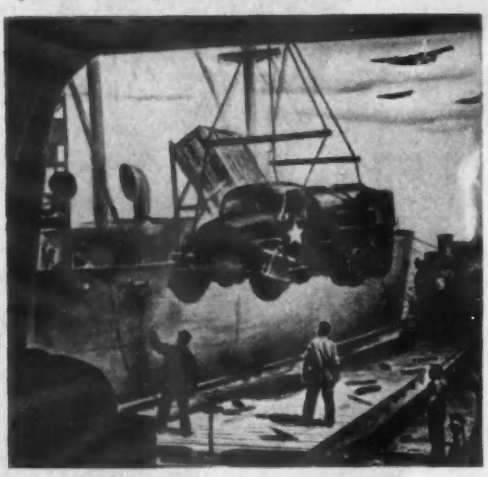
2. In long-range transport planes such as the Liberator Express, no wounded American fighter is more than 60 hours' flying time from the finest hospital in the U. S. A.

3. As the hospital plane streaks across the ocean, a flight nurse gives somebody's blood – perhaps *yours* – to this wounded soldier who might otherwise never get home for the special care that will restore him to health.

4. From many a remote combat zone, the plane is the *only* means of getting casualties back to base hospitals.

CONSOLIDATED VULTEE AIRCRAFT

5. **The ambulance, hospital train, and hospital ship** still transport most of our war casualties. But many a time when *minutes* can save a life, the 4-mile-a-minute speed of the flying ambulance does exactly that!



6. **One reason we are winning the war** is the way in which the truck, the train, the ship, and the plane are teaming up together. And the task of rebuilding the peacetime world will be a challenge which all forms of transportation must meet in the same way

. . .

But the plane, in addition to its use as a global air transport, will have still *another* role to fulfill: a permanent postwar Air Force can well become the ever-watchful guardian of the peace we shall have won so dearly.

No spot on earth is more than 60 hours' flying time from your local airport

From "Flying Jeeps" to Leviathans of the air — *The planes shown below were all designed and developed by Consolidated Vultee. When peace comes, the company will be in a position to provide the postwar equivalent of such planes, from small, privately owned "air flivvers" to huge, transoceanic cargo-and-passenger planes.*

LIBERATOR... 4-engine bomber

LIBERATOR EXPRESS... transport

COLONADO... patrol bomber

CATALINA... patrol bomber

VENGEANCE... dive bomber

VALIANT... basic trainer

RELIANT... navigational trainer

SENTINEL... "Flying Jeep"

QUICK FACTS FOR AIR-MINDED READERS

Air Giant — The new Consolidated Vultee Model 39 transport plane — the Liberator Liner — has passed its test flights successfully. Capacity of this 4-engine transoceanic airliner: 48 passengers — or, as a sleeper, 24. Top speed: 275 m.p.h. Flying range: over 4000 miles.

Airport for Air Giants — New York City's projected airport will have runways totalling 13 miles in length, one of which will be over 2 miles long. This airport can handle 1000 plane movements per day. (Capacity of present N. Y. airport: 270 plane movements per day.)

. . .

1000-mile Shuttle Trips — The Naval Air Transport Service in the Pacific now flies 320,000 miles per week, carries over 5500 passengers monthly, reports that it "adds another stop every time the Japs lose another island."

Tomorrow's Airmen: The total strength of the Army Air Forces now exceeds 2,300,000 officers and enlisted men — a vast reservoir of skilled pilots and aircraft technicians which will insure postwar America's remaining "a nation on wings."

Consolidated Vultee is the largest builder of airplanes in the world.

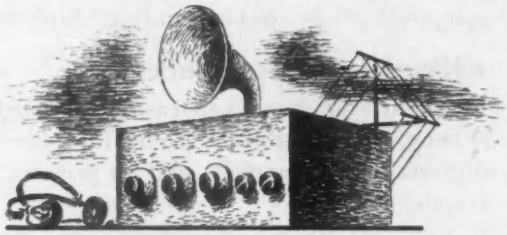
CORPORATION

San Diego, Calif. · Vultee Field, Calif. · Fairfield, Calif. · Tucson, Ariz. · Fort Worth, Texas · New Orleans, La. · Nashville, Tenn. · Louisville, Ky. · Wayne, Mich. · Dearborn, Mich. · Allentown, Pa. · Elizabeth City, N. C. · Miami, Fla.

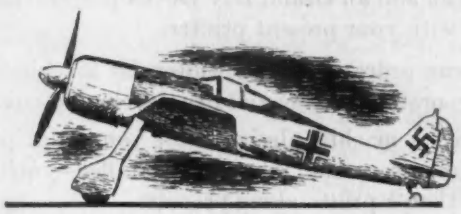
Member, Aircraft War Production Council

Let SIMMONDS take over part of the Control Room Job

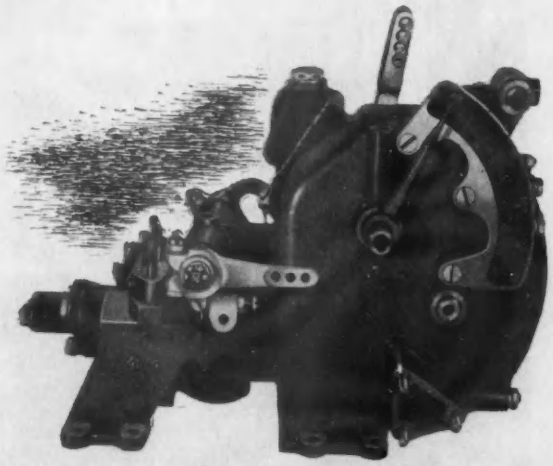
1. Contrary to the trend in other technical fields, the number of instruments and controls tends to increase with the power and size of aircraft. But just as complex conditions in other fields are being handled automatically, the Simmonds-Hobson Automatic Engine Control provides for the known variety of conditions in aircraft engine operation.



2. No one would consider buying a 5-dial radio today. Modern electronic engineering has demonstrated reception of absolutely equal clarity with only one selection and one volume control.



3. A captured Focke-Wulf 190 discloses a master engine control focusing engine operation in one lever for most flight conditions. The adoption of automatic controls by a resourceful enemy cannot be ignored.



4. Simmonds is now producing a proven control which relieves the pilot of constantly watching manifold pressure and adjusting his mixture. New models will soon extend automatic control to other important engine functions. Simmonds engineers will be glad to discuss the application of these controls to military or commercial aircraft.

SIMMONDS EQUIPMENT FLIES WITH EVERY TYPE OF ALLIED AIRCRAFT

Automatic Engine Controls • Push-Pull Controls • Spark Plugs • Hydraulic Accumulators • Hydraulic Fuses Chronometric Radiosondes • Self-Aligning Rod-End Bearings • Fasteners and Clips of Specialized Design

SIMMONDS
AEROCESSORIES INC.

Branch Offices: Dayton • Washington • Hollywood • Montreal

Manufacturing Plants: New York • Vermont • California

When you want more than prints of your drawings

Getting your drawings into print form...and to the men on the assembly line . . . is probably your first concern.

You are sure of faster results, and better prints, *when you have an Ozalid machine.*

You know, also, that you're equipped for more than "ordinary printmaking"... and that you can save time, labor, and materials—in print production. . . in the drafting room . . . throughout your organization.

You receive "extra values" because Ozalid is different from any other reproduction process. The *big* difference being OZALID DRY DEVELOPMENT.

IF YOU'RE NOT USING OZALID

- ▶ You can add an Ozalid Dry Developer which can be used with your present printer.
- ▶ You can order an Ozalid whiteprint machine which incorporates printing and dry developing units.

There's a machine designed for your print production requirements. When it's installed—you'll have *more* than a printmaking process.

EXTRA VALUES YOU RECEIVE WITH OZALID

• Ozalid Dry Development

Eliminates water and potash baths, driers, multiple controls. All types of prints are produced in the same operation—no "stops" in production. "Skilled Help" is no longer a printmaking requirement.

• Complete Line of Sensitized Materials

Papers, cloth, and foils can be processed—an impossibility with other methods. These are available in cut sheets as well as roll stock—thus you can eliminate trimming waste.

You can make prints having black, blue, or maroon lines on a white background. You can assign identifying colors to prints of different departments, distinguish checked from unchecked prints, etc.

• Ozalid Transparent Duplicates

May be substituted for valuable originals in subsequent print production . . . or employed by draftsmen to eliminate retracing when making design changes.

• Ozalid Foils

May be used to reclaim soiled or worn originals, to make composite prints...or fast printing "duplicate" originals.

• New Ozalid Rapid Black

Hailed by reproduction men as the finest dry developing paper ever made. Recommended for reproducing pencil drawings, typed material, and for printing from photographic positives.

For complete information, write for Catalog and samples of Ozalid Whiteprints.

OZALID PRODUCTS DIVISION

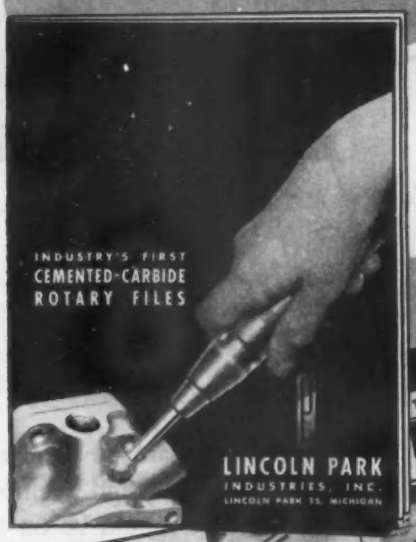
GENERAL ANILINE & FILM CORPORATION

Johnson City, New York

OZALID IN CANADA—HUGHES OWENS CO., LTD., MONTREAL

Now Carburs—INDUSTRY'S FIRST CEMENTED CARBIDE ROTARY FILES . . .

Carburs are now available in twelve standard shapes, each in from four to six different sizes and from fine to coarse cut—to meet almost any need. This new booklet contains illustrations and prices of all the standard tools now being produced. Write for your copy today.



Carburs have been put to almost every conceivable test, and from the results of these tests conducted in actual production it has been proved that Carburs offer at least fifty times the tool life of high speed rotary files. They provide a sharp cutting edge over a long period of time . . . reduce burring, filing or cutting time per part materially . . . and generally increase efficiency in these operations in all types of production.

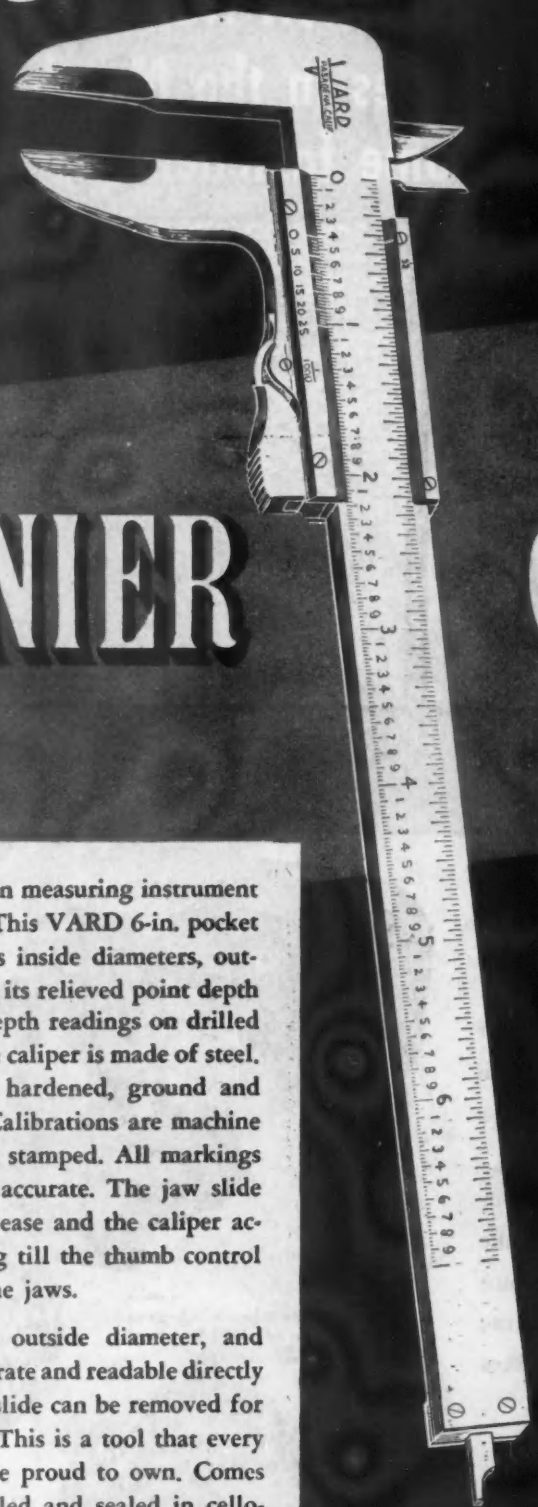
ARMY (E) NAVY

LINCOLN PARK INDUSTRIES, INC.

Successor to The Lincoln Park Tool and Gage Company and Carbur, Inc.

1727 FERRIS AVENUE • LINCOLN PARK 25, MICHIGAN

VARD



VERNIER CALIPER

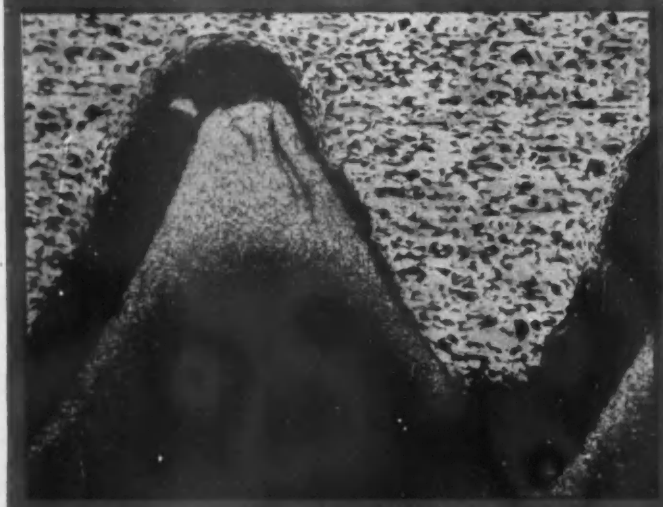
Here is a fine, precision measuring instrument for the machine trades. This VARD 6-in. pocket vernier caliper, measures inside diameters, outside diameters, and with its relieved point depth gage, accurately gives depth readings on drilled holes up to 6-inches. The caliper is made of steel. Measuring surfaces are hardened, ground and main jaws are lapped. Calibrations are machine divided and etched, not stamped. All markings are clear, readable and accurate. The jaw slide has a thumb control release and the caliper accurately holds its setting till the thumb control permits movement of the jaws.

All inside diameter, outside diameter, and depth readings are accurate and readable directly in .001-in. The vernier slide can be removed for cleaning and resetting. This is a tool that every master mechanic will be proud to own. Comes to you carefully set, oiled and sealed in cellophane. Packed in a neat, durable case. Ready to ship on order.

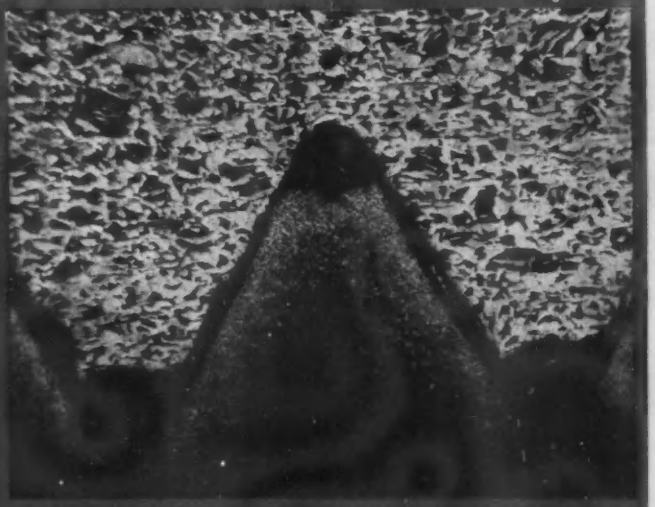
Write for descriptive literature and price sheet.

VARD INC.
PASADENA 8, CALIF.

WHAT HAPPENS TO STEEL WHEN NUT MEETS BOLT?
Blow them up 100 times in the Metalgraph and see why some fasteners fail



This photograph shows somewhat excessive decarburization in the bolt, and a lap in the thread. Nut is satisfactory. Heat treatment O.K.



Decarburization of bolt satisfactory. Thread form good. Heat treatment slightly deficient. Nut satisfactory.

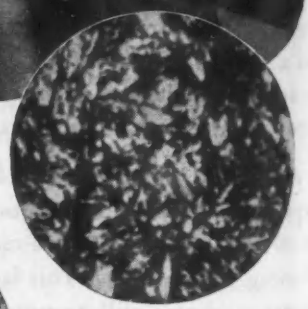
To the naked eye, nuts and bolts are just nuts and bolts. To be sure, surface defects are sometimes apparent, but they are easily detected.

What happens to the granular structure of the metal when the nut has been fastened to the bolt, and then broken in test, is something else again . . . and terribly important.

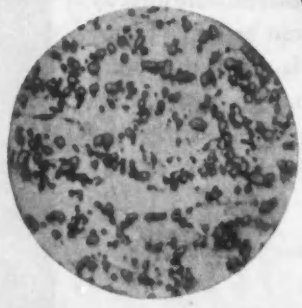
This is just one of the many precautions our metallurgists and engineers take to insure superlative performance . . . an example of the minute attention to details that makes for National Quality.

National
HEADED AND THREADED
PRODUCTS

Operator checking grain structure of steel by means of the Metalgraph.



Heat-treated alloy steel, enlarged 1,000 times.



Spheroidized alloy steel wire, enlarged 750 times.

THE NATIONAL SCREW & MFG. CO., CLEVELAND 4, O.

They "BITE" right because they're shaped right

"Occlusion" is the dentist's term for teeth that fit together properly to form the perfect "bite" . . . and if you are so blessed, you can thank your lucky stars.

But for the gear teeth in a Fuller transmission, you can thank Fuller engineers. Here, "occlusion" is not a matter of mere good fortune, but a scientific certainty . . . the direct result of endless research and testing in the field.

Fuller gear teeth have a *different* shape . . . a shape that provides greater strength and longer wear-life . . . a shape that assures proper meshing—the perfect "bite"—of the gears.

Make sure that the transmission in your new truck is a FULLER, for you will then be sure of getting a quiet running, easy shifting, longer lasting transmission. FULLER MANUFACTURING COMPANY, Kalamazoo, Michigan.

FULLER MANUFACTURING COMPANY, KALAMAZOO, MICHIGAN
Transmission Division
Unit Drop Forge Division, Milwaukee, Wisconsin

READY *for hard continuous work with*

PORUS-KROME*

* PORUS-KROME is pure chromium, applied by the Van der Horst process that produces pores to hold oil. It reduces wear and corrosion and greatly multiplies cylinder life. It is being applied to engine parts in the three Van der Horst plants, and by license agreement.

This engine cylinder, processed with PORUS-KROME, is ready for hard continuous work that would ruin ordinary cylinders and cause a work-stoppage for repairs.

PORUS-KROME is pure chromium, which is inherently resistant to corrosion and wear, applied by the Van der Horst process that produces tiny pores to hold oil and feed it back as needed for lubrication of cylinder surfaces.

Because of these characteristics, cylinders and liners treated with PORUS-KROME last 4 to 20 times as long as ordinary cylinders. Rings last 3 to 5 times longer, too, and risk of piston seizure is reduced to nought.

The discovery of PORUS-KROME made a real contribution to the improvement of internal combustion and steam engines, and progressive engine builders are planning to make use of its advantages in their improved peacetime engines.

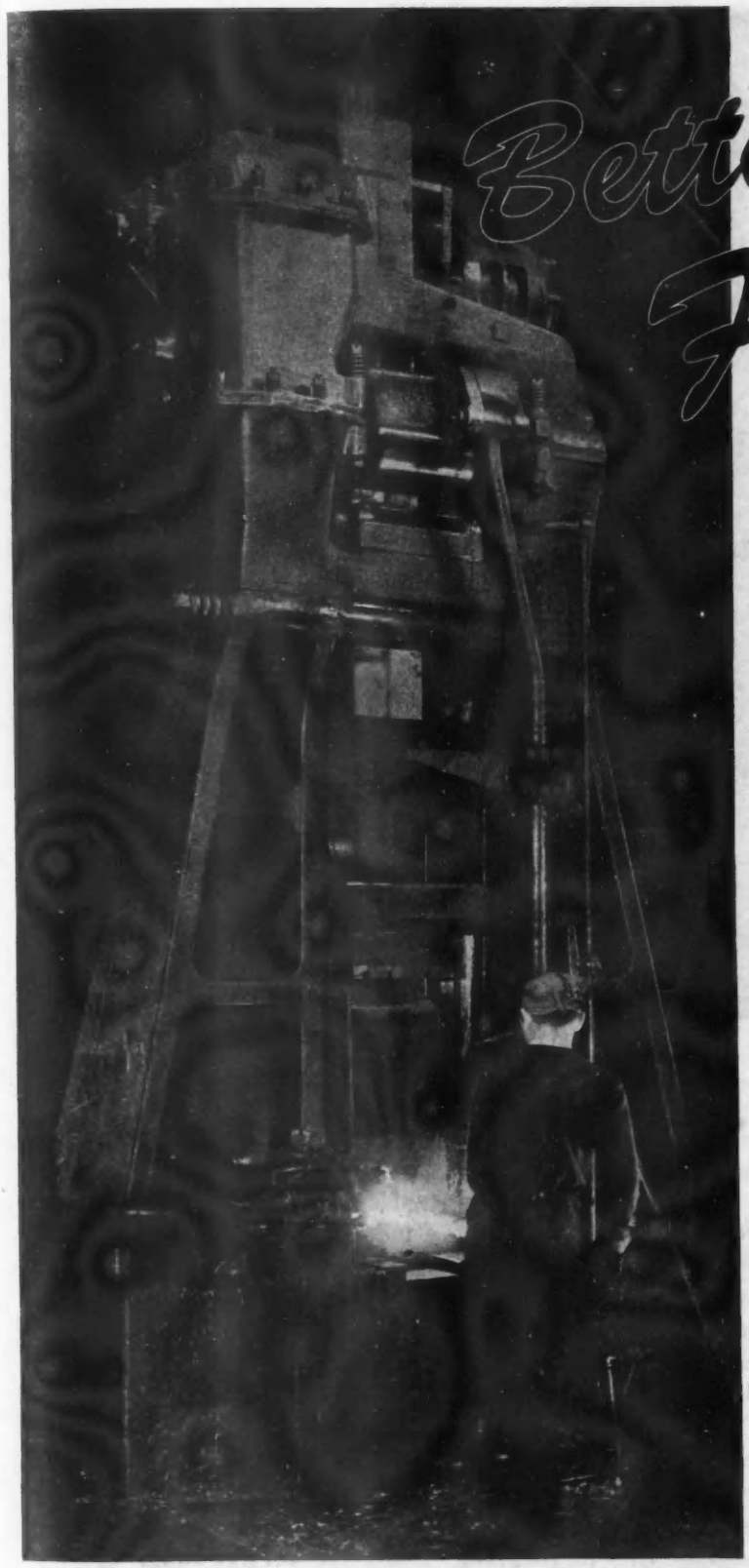
May we tell you how PORUS-KROME will add to the reliability of *your* engines?

PORUS - KROME VAN DER HORST

Good for the Life of your Engines

VAN DER HORST CORPORATION OF AMERICA OLEAN · NEW YORK CLEVELAND 11 · OHIO

AN AFFILIATE OF DRESSER INDUSTRIES



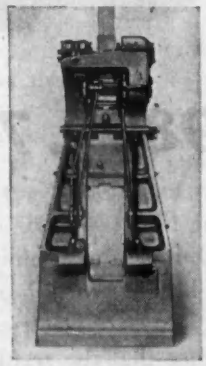
Better Drop Forgings

from Model J-2 CHAMBERSBURG Board Drop Hammer

In these war years when metal parts have been tested in the destructive jaws of the war machine and either discarded or ordered in increasing numbers, drop forgings have proved once again their essential value.

And for those drop forgings that can be made on the board drop hammer, the Chambersburg Model J-2 Hammer offers a greater degree of precision forging over a longer period of time.

Forgings made on this efficient hammer can be made to closer tolerances, are more uniform in quality and can be produced in greater quantities per hour.



Rear of Hammer showing Simplicity of Design.

The motor driven head is the acme of simplicity and quietness. The clean, well-proportioned lines of the hammer as shown in the illustration are indicative of the heavy, well-balanced anvil and frames.

Further details are described in Bulletin 252-2. Write for a copy.

CHAMBERSBURG ENGINEERING CO., CHAMBERSBURG, PA.

ARMY E NAVY

CHAMBERSBURG

HAMMERS · CECOSTAMPS · PRESSES

"798 . . . 799 . . . 800 . . . Impossible!"

This is a welding tip.

At every weld, it creates a miniature inferno of blazing white heat. It carries heavy surges of electrical current, so intense that the resulting heat will "melt" or fuse two pieces of metal together.

In the spot welding of aluminum, this intense heat has often made it necessary to stop production and dress or replace the electrodes as frequently as every 30 welds. Now, however, by cooling the electrodes with a refrigerated liquid, it is sometimes possible to make as many as 800 welds before it is necessary to dress or replace the welding tips . . . another amazing application of G-E industrial refrigeration!

Many, many other new and improved techniques in refrigeration and air conditioning are helping industry do the "impossible" in war production today. They'll all be available, and *ready* for any commercial or industrial application after Victory.

To place your name high up on the preferential list for earliest available data on finer postwar air conditioning equipment, write *now* to: *General Electric Company, Air Conditioning and Commercial Refrigeration Divisions, Section 447, Bloomfield, New Jersey.*

☆ BUY WAR BONDS ☆

Industrial Refrigeration by

GENERAL ELECTRIC

Hear the General Electric Radio Programs: The "G-E ALL-GIRL ORCHESTRA," Sundays, 10 p. m., E W T, N B C . . . "THE WORLD TODAY" News, Every Weekday, 6:45 p. m., E W T, C B S

FOR YOUR POSTWAR CYLINDER HEADS

"How are aluminum cylinder heads behaving?" A continuing research program is gathering such data from cars parked within reach of Alcoa's automotive laboratory. Every kind and vintage of automobile is represented.

A car owner grants us permission to examine his engine while he's doing war work in this Alcoa plant. The aluminum head is pulled off of his engine and studied by experts. Day after day, these inspections go on, gathering data which will serve as a guide for designers of your postwar engines.

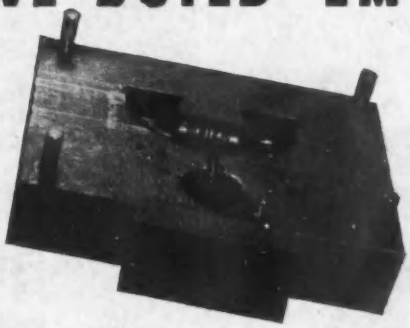
Results of these examinations have influenced Alcoa's recommendations regarding aluminum applications in the war effort. Designers of engines for fighting equipment have been able to avoid pitfalls of past designs.

How cylinder head gaskets match up with water passages, the number and placement of hold-down studs and the chemical content of cooling water affect the behavior of cylinder heads. Alcoa research is determining "how".

Of course, you have not been able to get aluminum cylinder heads. Winning the war comes first. But aluminum is now being used for other-than-war purposes, as the manpower situation permits. Our representatives will be glad to discuss the availability of aluminum with you.

ALUMINUM COMPANY OF AMERICA, 2110 Gulf Building, Pittsburgh 19, Pennsylvania.

WE CAN'T BUY 'EM — SO WE BUILD 'EM



Cannon Quality Control requires tools and dies of exceptionally close tolerances. So to meet our standards we make our own.

That's doing it the hard way but it's worth it. For now we have a tool and die manufacturing plant second to none in precision, accuracy and general excellence of product.

It's an organization of skilled tool makers, none with less than seven years experience. These expert craftsmen work with the best equipment and the finest materials. It is a big plant with a capacity many times our ordinary needs. But this production margin means better tools, more efficient machines, replacements long before exhaustion and thus, of course, connectors we're proud to identify with the Cannon trade mark.

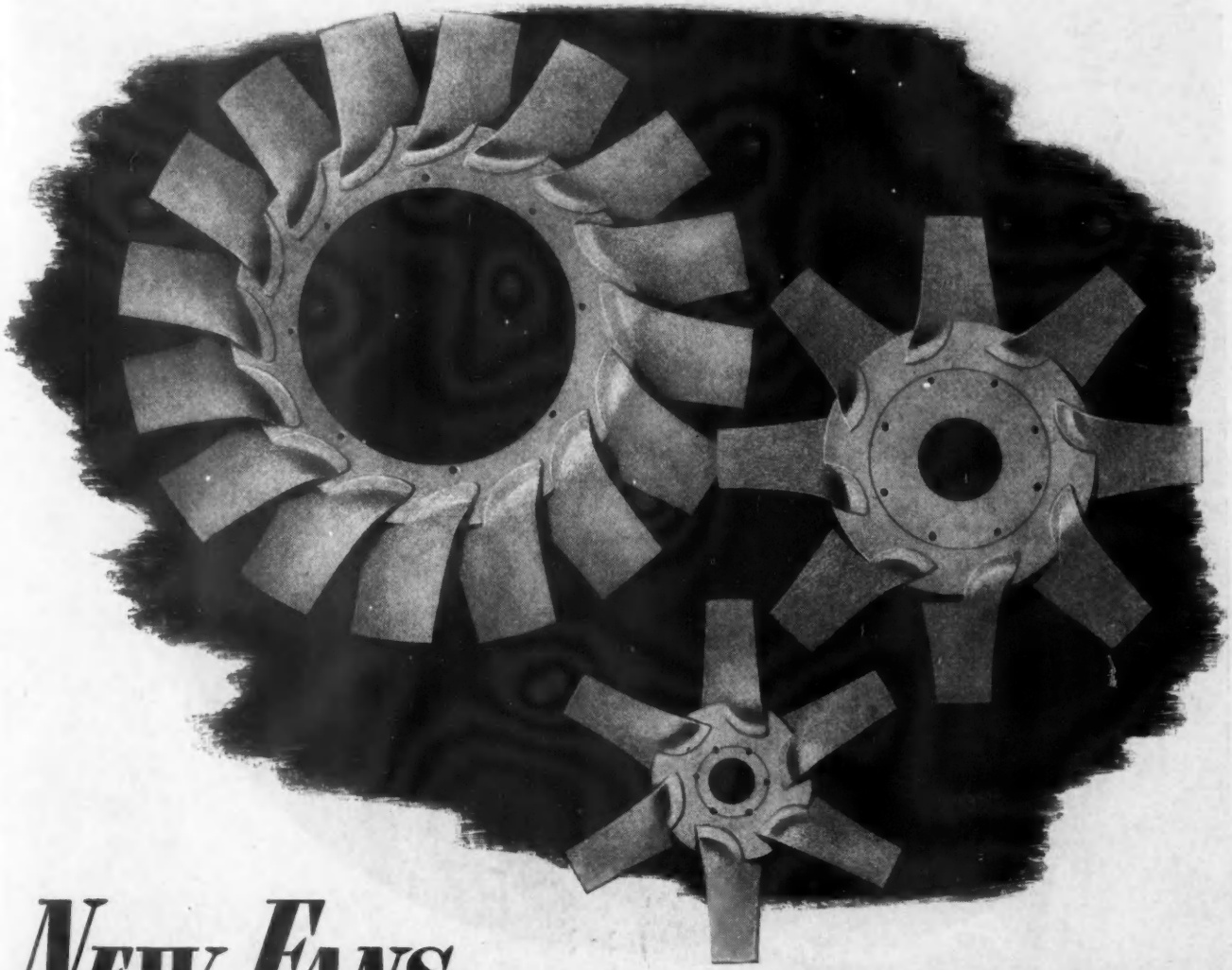
CANNON ELECTRIC

Cannon Electric Development Co., Los Angeles 31, Calif.

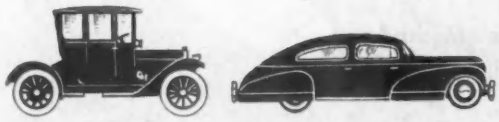
Canadian Factory and Engineering Office: Cannon Electric Co., Ltd., Toronto

Representatives in principal cities — Consult your local telephone book

Cannon AN Bulletin free on request. Address Dept. A-109 Cannon Electric Development Co., 3209 Humboldt Street, Los Angeles 31, Calif.



NEW FANS TO COOL "BURIED" ENGINES



HOW DIFFERENT—*the cars of yesterday and tomorrow—design, engines, chassis, brakes—but DeBothezat engine cooling fans are* the first major advance in fan design *for the car of tomorrow.*

DEBOTHEZAT TECHNICIANS have developed new fans for cooling "buried" engines efficiently. These new fans which consume *low* horsepower, facilitate lighter engine design without loss of present day efficiency. ¶ The principles and performance of these fans have already been proven in cooling the big deeply buried, air-cooled radial aircraft engines of U. S. Army tanks. ¶ What do these new engine cooling fans look like? *That depends on your engine design.* Above are three DeBothezat fans for "buried" engines—each one different—each one engineered for specific requirements. Incorporating new and advanced principles of the laminar flow profile and patented construction, De Bothezat fans are designed for peak performance in each installation.

De Bothezat Fan Division

American Machine and Metals, Inc.

East Moline, Illinois

Catch Trouble At This Point

● To assure flawless performance by finished products one consistent procedure must be followed: *Regular inspection of each part before assembly.*

Magnaflux* is the modern method that inspects every part quickly and thoroughly revealing flaws before time, labor and money are wasted on building a defective part into the product. Used to inspect gears, cams, steering knuckles, crank shafts and other magnetic metal parts, the nondestructive Magnaflux Method reveals cracks, and other discontinuities, at or near the surface.

Magnaflux equipment specifically designed for automotive and aviation parts inspection has been refined and proved by over a decade of service. This equipment is assuring manufacturers in this field that their parts are functionally sound, to take with a margin of safety the stresses that modern wartime use places upon them.

Magnaflux Research

Since the pioneering stage of the original Magnaflux Method for steel, our engineers have sought to extend the benefits of *rapid nondestructive* inspection techniques in every field. In the aircraft and automotive industries this activity has resulted in a constantly growing circle of satisfied Magnaflux users.

*A Registered Trade Mark descriptive of Inspection Methods, Materials and Equipment of Magnaflux Corporation.

MAGNAFLUX CORPORATION

5904 Northwest Highway, Chicago 31, Illinois

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MAGNAFLUX CORPORATION

You are looking at the first and only *Floating* LAMP


MACHINE TOOLS


ASSEMBLY LINES


INSPECTION BENCHES


DRAFTING BOARDS

FLOATING is the only word to describe the effortless action of the Dazor Lamp. For a slight touch will *float* this light exactly where it's needed, as easily as a man can move his arm. And it *stays put* without locking. Raise, lower, push, pull or turn the Dazor *Floating* Lamp — it remains firmly and automatically held in position. Thus *localized* lighting acquires new efficiency . . . increasing production, improving accuracy and safety, lowering costs.

Each job presents a separate problem of illuminating the working area. With the Dazor *Floating* Lamp an employee gets lighting *flexibility* at the point of work. He can control intensity . . . avoid reflected glare . . . curtail eye-strain, fatigue and error. A single spring force acting through an ingenious linkage and arm parallelogram balances the lamp arm in any desired position. Both Fluorescent and Incandescent Dazor Lamps are available; 4 bases cover every type of machine fastening and portable plant use.

In thousands of industrial and governmental operations, economical Dazor *Floating* Lamps are contributing to high productive capacity. They are distributed by electrical wholesalers, selected for ability to serve. Call your electrical wholesale supplier or write us for the names of our distributors in your locality. Upon request for Booklet "I" we will also send a 16-page Illustrated Catalog describing Dazor models, features, applications.

Dazor Manufacturing Co. • 4469 Duncan Ave., St. Louis 10, Mo.

DAZOR *Floating* LAMPS

FLUORESCENT *and* INCANDESCENT

HILLS-McCANNA
MAGNESIUM ALLOY
SAND CASTINGS

OFFER GREAT LATITUDE OF APPLICATION FOR YOUR POST WAR PRODUCTS

HILLS-McCANNA Magnesium Alloy Sand Castings are doing wonders for our War Planes . . . and will do wonders for your peace-time products, too!

Lightest in weight of all structural metals . . . tough and strong, Magnesium Alloy Sand Castings offer Industry unsurpassed advantages for reciprocating parts of machinery, portable and manually handled tools, transportation equipment, office machines, aircraft engine parts, landing wheel assemblies, household appliances, etc.

Our large modern foundry, fully equipped and in mass production, assures quality castings, backed by dependable chemical and metallurgical control, heat treatment and complete machining facilities at reasonable cost.

Let us work with you in adapting Hills-McCanna Magnesium Sand Castings to your particular needs.

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Manufacturers of
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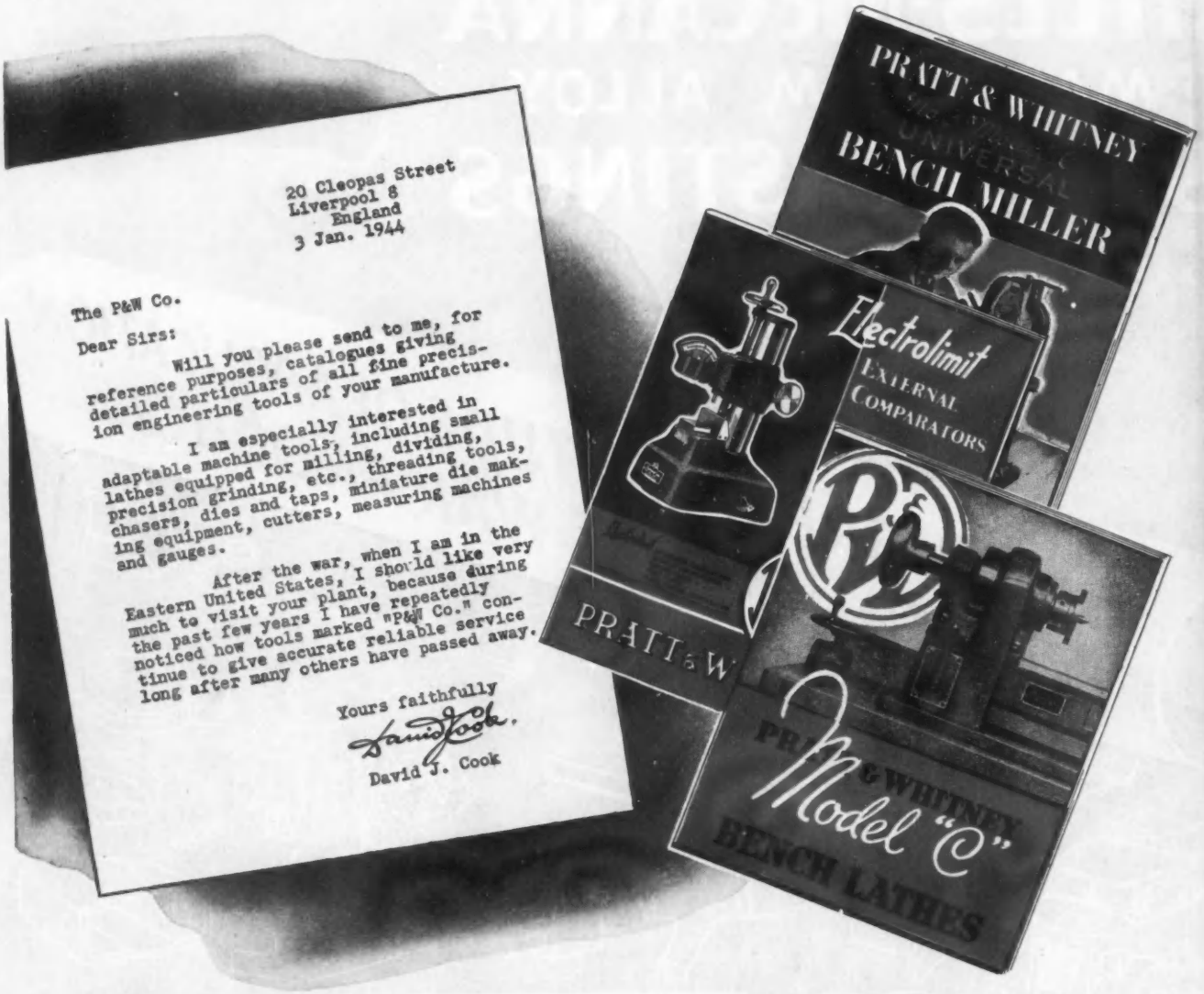
MARINE VALVES • FORCE-FEED LUBRICATORS • MAGNESIUM CASTINGS

FOUNDERS OF NON-FERROUS ALLOYS SINCE 1870



"They're in the mail, Mr. Cook"

Needless to say, we lost no time in forwarding all necessary information to our appreciative customer across the Atlantic.

This message of commendation from overseas illustrates, as nothing else can, the fulfillment of a promise — the promise of fine tool-making.

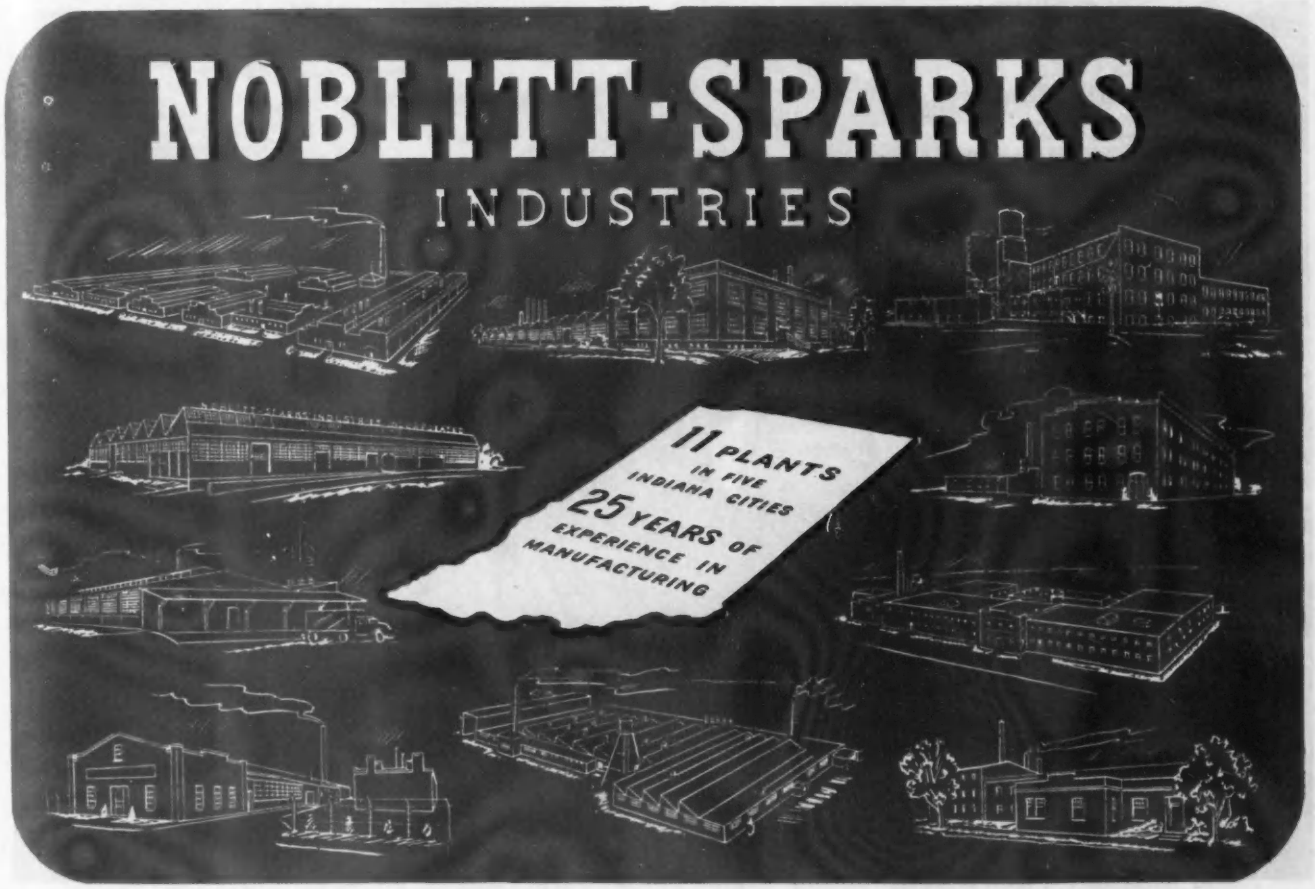
Now, as never before in history, precision tools are being given a chance to prove their worth — or drop out. In Britain, for even more years than here at home, precision tools have been taking the terrific, high-pressure beating of wartime mass production. Only phenomenal toughness and complete accuracy can stand up under this never-ending grind.

As Mr. Cook points out, long after other tools have reached the scrap-pile, *P&W tools can take it.*

PRATT & WHITNEY

Division Niles-Bement-Pond Company

WEST HARTFORD • CONNECTICUT



You Can Depend On Us For

Fabricated Metal Tubing

OR TUBING AND STAMPING ASSEMBLIES

● Because of our years of experience in volume production of metal tubing and stampings, we may have the exact facilities and the "know how" to fabricate what you need, to your advantage.

Noblitt-Sparks makes and forms metal tubing into any shape—welds it to other parts stamped from metal—assembles, plates or paints the entire unit—ready to go into your product. We've been doing that for many manufacturers—for 25 years—companies who have depended on us for many different kinds of assemblies. Perhaps we can help you, now or later—with engineering assistance, as well as production. If you have a specific job in mind, write or call . . .

Harlow Faulke

Vice-President and Director of Manufacturer's Parts Division

NOBLITT-SPARKS INDUSTRIES, INC. • COLUMBUS, INDIANA

Who's "ALL WET"?

SURE, he *looks* all wet. But his thick, oily underfur keeps his skin bone dry—prevents him from absorbing a single drop of moisture.*

Resilient plane parts have no such protection. They're constantly under attack by petroleum products which may cause them to swell, reduce the capacity of hose, accumulator bags, valves, and similar parts. Absorption of oil causes planes to take on dead weight not included in original design—lessens speed—cuts pay-load.

Hycar synthetic rubber, light in weight and highly resistant to oil, provides unexcelled protection against increased weight, decreased capacity. 15% to 25% lighter than many other synthetic rubbers, Hycar *stays* light—insures dimensional stability of parts by non-absorption of petroleum products.

Hycar has an operating range of −65° to +250° F. and resists abrasion 50% better than natural rubber. Unlike most oil-resistant synthetic rubbers, Hycar has a minimum tendency to cold flow after taking the initial set.

You need these qualities in resilient materials used in the presence of oil and gasoline. Let our Technical Service Staff help solve your individual problems. *Hycar Chemical Company, Akron 8, Ohio.*

**Facts verified by Fish & Wild Life Service, U. S. Department of the Interior*

Hycar

Reg. U. S. Pat. Off.

LARGEST PRIVATE PRODUCER OF BUTADIENE TYPE

Synthetic Rubber

Correct pronunciations and meanings of commonly used synthetic rubber names and terms are given in the new pocket-size Hycar Glossary. Write for free copy.

Rates "TOPS" with Industry

for these 3 important reasons

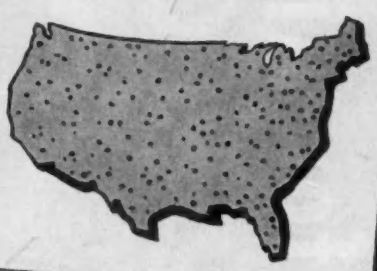
NATIONAL (TRADE MARK) CARBIDE

You can depend on National Carbide—the famous "carbide in the red drum". More than a quarter century of widespread use has established the economy, uniformity and productivity of this quality carbide.

National Carbide is available in all sizes for generator use—packed in standard size drums. For the address of your nearest National warehouse or distributor, write to Air Reduction's New York office, Dept. A.

1. NATION-WIDE LOCAL DISTRIBUTION

Prompt deliveries in large or small quantities from more than 250 warehouses located in or near all major manufacturing centers. Also supplied by local dealers and distributors.



2. HIGH ACETYLENE YIELD ASSURED

Hourly testing and the use of exceptionally fine quality materials and strictly-controlled manufacturing procedures, produce a carbide practically free from impurities.

3. DUST-FREE IN THE DRUM

Because National Carbide is screened with extreme care. It is carefully packaged under strict supervision in air-tight drums in order to prevent contamination and deterioration.

BUY U. S. WAR BONDS

AIRCO ACETYLENE GENERATORS

Ideal Team-mates for National Carbide

For dependable volume production of acetylene, use National Carbide in Airco Acetylene Generators. Five sizes to choose from—15 lb., 30 lb., 50 lb., 300 lb. and 500 lb. single or double rated. The first three sizes are portable types and the latter two are stationary. These generators are listed by the Underwriters Laboratories, Inc. Write to Air Reduction's New York office for descriptive folder ADC 619, Dept. A.

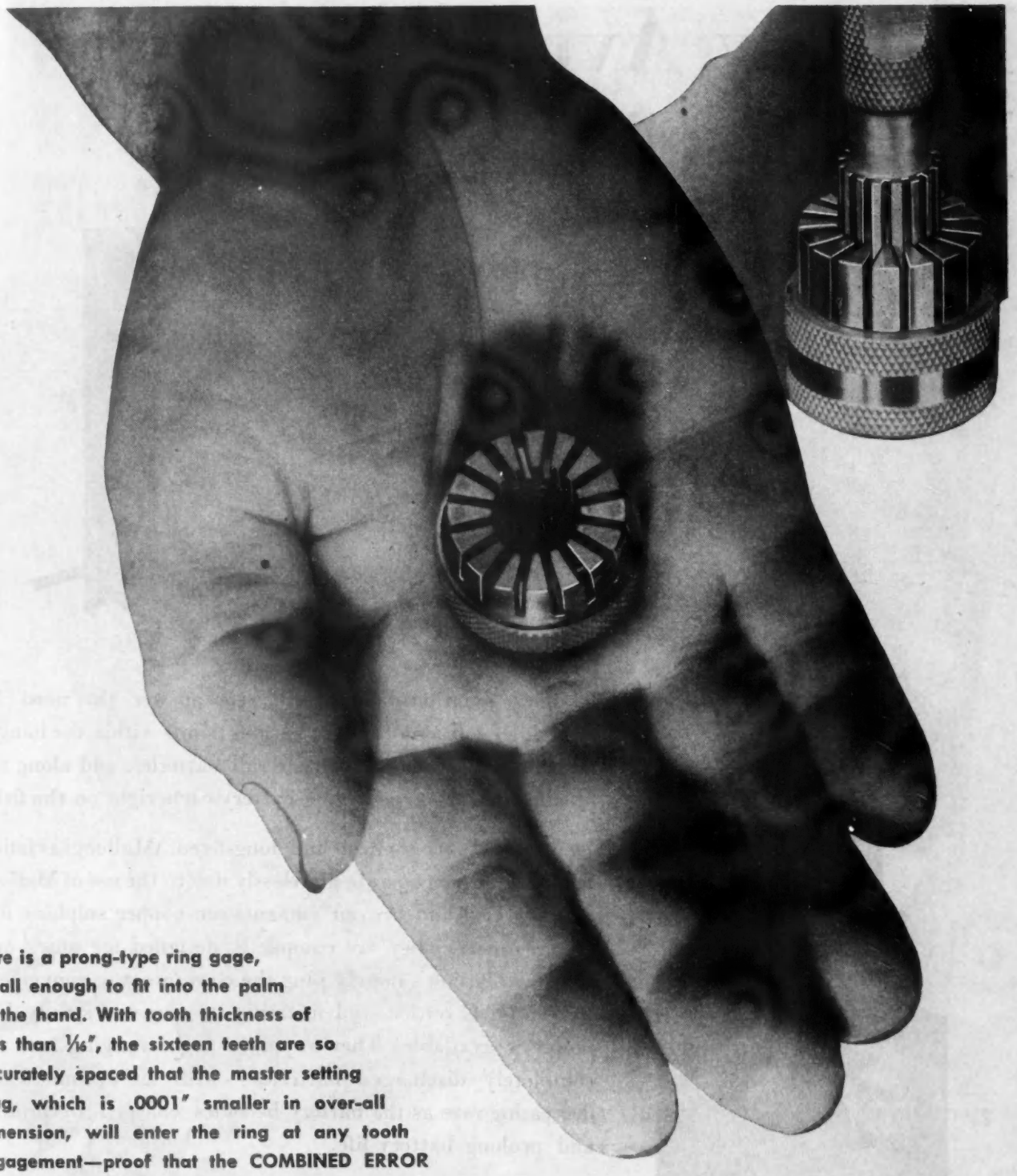
AIRCO WILSON

AIR REDUCTION

General Offices: 60 EAST 42nd STREET, NEW YORK 17, N. Y.

In Texas: MAGNOLIA AIRCO GAS PRODUCTS CO. • General Offices: HOUSTON 1, TEXAS

Offices in all Principal Cities



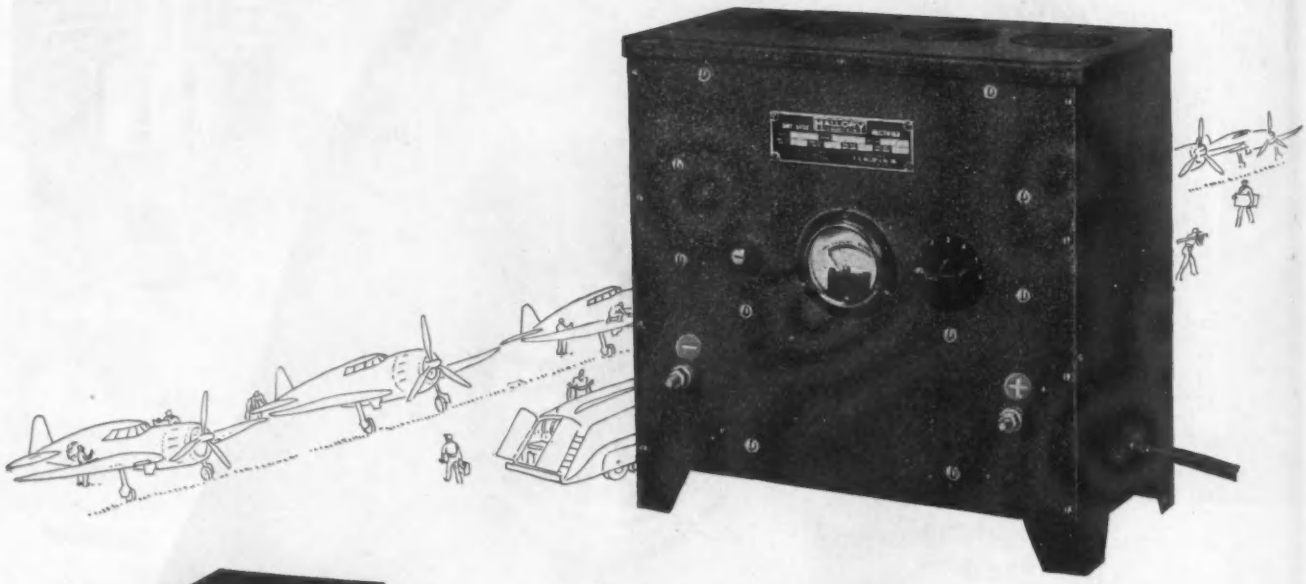
Here is a prong-type ring gage, small enough to fit into the palm of the hand. With tooth thickness of less than 1/16", the sixteen teeth are so accurately spaced that the master setting plug, which is .0001" smaller in over-all dimension, will enter the ring at any tooth engagement—proof that the COMBINED ERROR in spacing, parallelism and centrality of teeth IN BOTH PARTS cannot exceed .0002". A good gage is mechanically exact. Vinco makes good gages.

VINCO CORPORATION, 8869 SCHAEFER HIGHWAY, DETROIT 27, MICH.
SALES OFFICES— NEW YORK CLEVELAND CHICAGO

MILLIONTHS OF AN INCH FOR SALE BY VINCO

Semi-Automatic Hydraulic Spline and Gear Grinder • Optical Master Inspection Dividing Head • Involute Checker • Angle Tangent to Radius Dresser • Index Plates • Precision Vises • Sine Bars • Straight-side Spline, Serration Spline, Involute Spline and Helical Spline Plug and Ring Gages • Thread Plugs, Rings and Setting Plug Gages • Spur and Helical Master Gears • Munition Gages • Propeller Hub Gages • Built-up and Special Gages • Gear Rolling Fixtures • Spline and Index Fixtures • Hydraulic Power, Control, Utilization and Distribution Units • Engineering, Design and Development.

Mallory Aviation Battery Chargers



Mallory aviation battery chargers answer the need for charging facilities located at various points within the hangar for charging 12 and 24 volt aircraft batteries, and along the starting ramp for recharging battery carts right on the field.

Dependable, economical and long-lived, Mallory aviation battery chargers operate noiselessly due to the use of Mallory "Time-Tried and Proven" magnesium copper sulphide dry disc rectifiers. They are compactly designed for quick and easy installation—merely plug the cord into any convenient 115 volt AC outlet, and instantly a source of steady DC power is available! They supply a high charging rate for completely discharged batteries — with an automatically decreasing rate as the battery becomes charged to protect and prolong battery life.

For complete information on full charging facilities for all aviation needs, see your Mallory distributor or write direct.

P. R. MALLORY & CO., Inc., INDIANAPOLIS 6, INDIANA

ARMY E NAVY

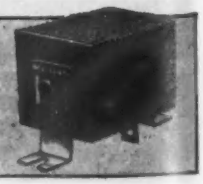
Buy Bonds—and Keep on Buying

* *Rectostarter is the registered trademark of P. R. Mallory & Co., Inc., for rectifier units for use in starting internal combustion engines*

P.R. MALLORY & CO. Inc.

MALLORY

MAGNESIUM COPPER SULPHIDE RECTIFIERS—
STATIONARY AND PORTABLE D. C. POWER SUPPLIES—
BATTERY CHARGERS AND AVIATION RECTOSTARTERS*



EVERYONE RESPONSIBLE FOR EFFICIENT LUBRICATION OF MACHINERY SHOULD HAVE THESE

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and Prevent Accidents

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On Lincoln Centro-Matic Lubricating Systems.

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LINCOLN ENGINEERING COMPANY

Pioneer Builders of Engineered Lubricating Equipment

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From Farms to-
FIGHTING FRONTS

ORCO *products are in ACTION*

● ORCO processes for bonding rubber and synthetic rubber to metal have improved the efficiency and lengthened the service life of farm operating machinery.

Long before the war, ORCO engineers co-operated with farm equipment manufacturers in the elimination of metal to metal contacts that not only were causing excessive wear of working parts but were limiting the use of specific types of farm equipment.

Such pre-war achievements of ORCO engineers have contributed immeasurably to keeping pre-war farm machinery in action during the past few years when new farm machinery was difficult or impossible to obtain.

When war broke, ORCO engineers were called in for co-operation on the production of such widely diversified products as:

auxiliary fuel tanks for airplanes, tank tracks, diving masks and diving equipment, high altitude oxygen mask equipment, airplane engine parts, parts for bombers and other warplanes, two-man and eight-man Kayaks (landing boats), life belts, inflation systems for rubber boats, submarine goggles, and numerous military products of a secret nature.

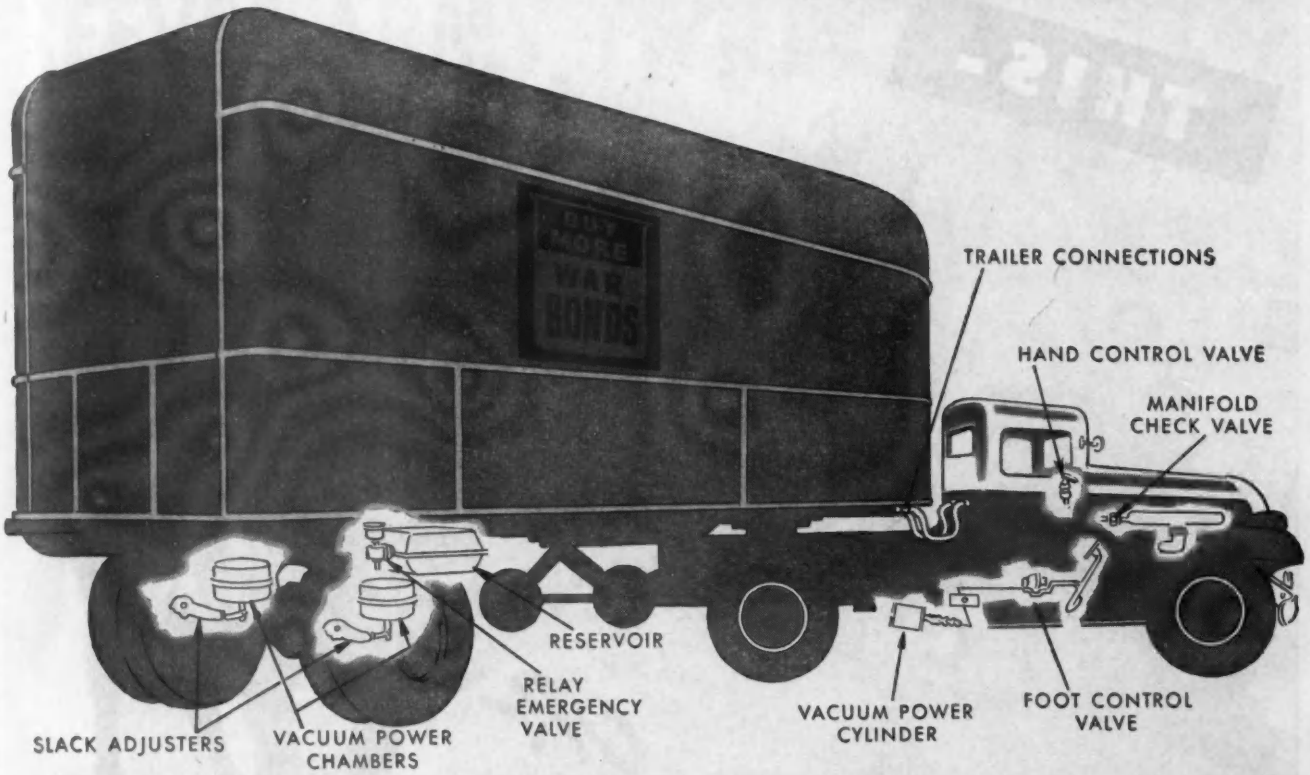
The cumulative experience of The Ohio Rubber Co. before and during this war points to one obvious conclusion: the ability of our organization to extend to YOU what we term "ORCO-OPERATION."

"ORCO-OPERATION"

THE OHIO RUBBER COMPANY · WILLOUGHBY, OHIO

BRANCHES: DETROIT · NEW YORK · CHICAGO · INDIANAPOLIS · WASHINGTON · CLEVELAND

Absolute Control for All Loads, on All Roads!



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IMPORTANT FEATURES in MIDLAND VACUUM BRAKES

- ★ Simple in design—rugged in construction.
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- ★ Thoroughly and carefully engineered and tested.
- ★ Interchangeable in fleet operation.
- ★ Less lining wear—fewer brake adjustments.
- ★ Factory rebuilt exchange plan.

Today's heavy loads and strict delivery schedules make Midland Vacuum Brakes a greater asset than ever. The absolute control provided by Midland's exclusive, fully compensating control valves stops any load—quickly—safely—easily.

Midland Vacuum Brake Kits are designed and engineered especially for all popular makes of trucks. Safeguard your equipment, and your delivery schedules, by giving your trucks the dependable protection of Midland Vacuum Brakes. Specify Midland when ordering new vehicles.

THE MIDLAND STEEL PRODUCTS CO.
10603 MADISON AVENUE, CLEVELAND 1, OHIO
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MIDLAND
CHRISTENSEN
POWER BRAKES

THIS?

← *This Seals the Air!*

All Standard Schrader Valve Caps contain this specially designed sealing unit with a dome-shaped rubber washer vulcanized between two dome-shaped BRASS plates. Because of their unique construction, these caps are guaranteed airtight up to 250 lbs. pressure. This mighty midget does the work.

MR. & MRS. AMERICA

A flat or underinflated tire on the road today may mean no car to drive tomorrow. Don't let this happen to you. Check your tires now. Are they properly inflated? Is there a cap on each tire valve? Airtight Schrader valve caps are available in the familiar red, white and blue package wherever gas or tires are sold—or tires are serviced.

You wouldn't use a donkey if your tires gave out? Perhaps not—but if you couldn't get new tires, you wouldn't drive your automobile either. And actually the situation is that serious. No new tires are in prospect for most of us for a long time. Therefore, if you want to keep on driving, be sure your tires are properly inflated NOW—for underinflation ruins tires.

The easiest and most effective way to prevent costly, destructive tire wear is to keep your air pressure up—for a 6.00 x 16 tire underinflated only 6 lbs. (as an example) loses 30% of its mileage. The remedy is simple. Put air in. Keep air in. Be sure that every tire valve has a Schrader tire valve CAP to *seal* that air in. Screwed down fingertight, these caps prevent leakage through the valve mouth. And—remember—it's that last turn that makes the absolute seal.

Schrader
CONTROLS THE AIR

NEXT TIME YOU GET GAS

Get Air—Get AIRTIGHT CAPS

SOLD EVERYWHERE

A. SCHRADER'S SON, ***Division of Scovill Manufacturing Company, Incorporated,*** **BROOKLYN, NEW YORK**

FOR POST-WAR UNIFORMS THAT SPELL SERVICE

REEVES ARMY TWILL

"FROM COTTON TO CUTTER"

Leading bus companies are typical of the many customers for Reeves Army Twill. Whatever the industry, if uniforms are needed, this top-quality fabric tailors smartly and gives superb service. Over 80 million yards of it have already been used to help equip America's fighting men, and it is proving itself under the toughest climatic and combat conditions of global war. This fabric, Sanforized Shrunk* and color-fast to sun, water and perspiration, will meet *your* post-war uniform needs. When the time comes to order them, choose from a wide range of popular colors — for long-lasting good looks insist on Reeves Army Twill.

**Residual shrinkage less than 1%*

THE REEVES FABRIC GROUP INCLUDES: *Reeves Army Twill • Glengarrie Poplin • Reeveking Gabardine • Byrd Cloth • Marine Herringbone • Reeves Sateen • Warrior Twill*

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Mills Mill, Greenville, S. C. and Woodruff, S. C.
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REEVES BROTHERS, INC.

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Another Battle Front Oxygen Producing Plant

ANOTHER, another in the steady stream of Independent Mobile Oxygen Generators is on its way to our fighting forces... *somewhere* on the world Battle Fronts... supplying oxygen to our "*hi-flying*" air squadrons who could not leave the ground without their oxygen tanks filled. • • Independent... *first* to produce these Mobile Oxygen Generators—First Too in actual service—You'll find Independent Engineering Company *first*—after Victory —to supply *you* with equipment for producing industrial gases for peace-time pursuits.

Independent Engineering Co.—Pioneer designers and producers of Mobile Oxygen and Hydrogen generating plants for the armed forces... builders of Oxygen, Hydrogen and Acetylene plants —manufacturers of industrial gas cylinders and cylinder handling equipment.

ARMY E NAVY

INDEPENDENT ENGINEERING CO.

O'FALLON INCORPORATED ILLINOIS

Are Your War Contract Machines

CONVERTIBLE?

Here's an experience that may suggest what you can do about conversion—NOW! . . . .

THIS IS the story of how one of our leading manufacturers "disposed" of a group of surplus war production machines by having them converted to a different operation on a different contract—at a money saving of about one third of the cost of buying new machines of comparable efficiency.

There were eight machines in all, two each of three well-known standard makes and two Snyder "specials." When our study of the proposed production operation indicated that conversion was practical, the machines, consisting of base end sections with machine unit slides upon them, were shipped to our plant.

Converting the standard machines involved building new center sections (between each pair of base ends) upon which fixtures were mounted. Two-spindle milling heads were mounted on the sliding sub-assembly units and as these units were of three different designs it was necessary to use specially made adapters so that identical milling heads could be used throughout.

When conversion was completed, we delivered to our client five two-way machines, hydraulically operated and electrically controlled, for a medium sized milling operation upon an ordnance part. Three machines were made from the three pairs of standard units and two from the two Snyder "specials."

This job is typical of many retooling jobs that can be done when war contracts are terminated and the urgent need of the moment is to convert every possible machine to postwar application.

Not all machines will be so readily convertible, of course, but many will and it may be possible that many manufacturers will be able to buy their present machines from the government at favorable prices, have them converted, replace them in their line and put them to work on civilian goods at a very substantial saving in capital investment and at an even more important saving in time.

Such procedure would help greatly in solving the three-way problem of disposing of government-owned machinery, getting necessary new machinery and getting floor space for the changeover.

And, of course, getting machines converted in a matter of weeks instead of having to wait months for new machines naturally is going to help in getting men back to work quickly.

Whether conversion is practical in the case of your machines depends upon a number of factors which we will be glad to discuss with you if you will write us fully, listing your machines and describing your proposed products and production objectives.

Clarence Snyder
PRESIDENT

SNYDER TOOL AND ENGINEERING COMPANY
3400 East Lafayette • Detroit 7, Michigan

SNYDER
DESIGNERS AND BUILDERS OF SPECIAL-PURPOSE MACHINES FOR HIGH PRODUCTION AT LOW UNIT COST

20 Years of Successful Co-operation with Leading American Industries

SICILY

ALASKA

BOUGAINVILLE

NEW GUINEA

Photos: U. S. ARMY SIGNAL CORPS

"BULLDOZING" THE AXIS!

"CATERPILLAR" BULLDOZERS, EQUIPPED WITH FEDERAL-MOGUL BEARINGS, ARE THE ALLIES' NO. 1 FIGHTING TOOL

Recruited for use as a military construction implement, the bulldozer-equipped "Caterpillar" Diesel tractor, which uses Federal-Mogul sleeve bearings, has stolen the show on many a beachhead and invasion front. First ashore with the infantry, to clear beaches, build dirt ramps for landing craft, prepare air runways, the tractor-bulldozer has been used to destroy pillboxes and caves holding enemy suicide groups, shake snipers from tree-tops, form a strong shield for advancing troops—in addition to performing a multitude of herculean construction jobs.

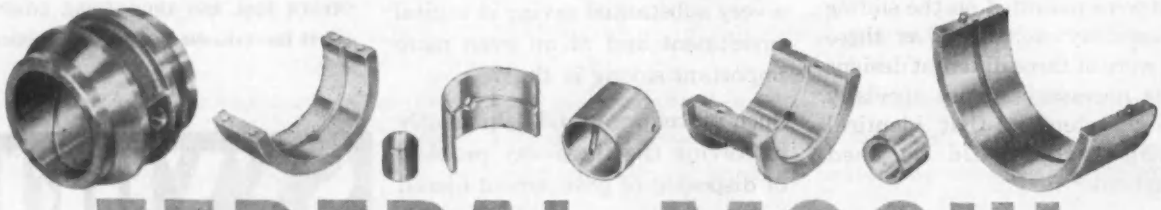
Tens of thousands of bearings, bushings and similar precision parts leave our six well-equipped plants daily to serve on America's weapons of war. As the war ends, we will turn, almost without interruption, to bearing production for the automobiles, trucks, refrigerators, diesel engines, tractors, and many other much-needed peacetime power units. Wherever shafts turn in sleeve bearings, for 45 years FEDERAL-MOGUL sleeve bearings have been the recognized standard of dependable quality.

FEDERAL-MOGUL CORPORATION, DETROIT 13, MICHIGAN

Bearing Specialists Since 1899

Sleeve bearings and bushings designed, developed and manufactured for engines, pumps, compressors, large machine tools and all applications where such parts are used.

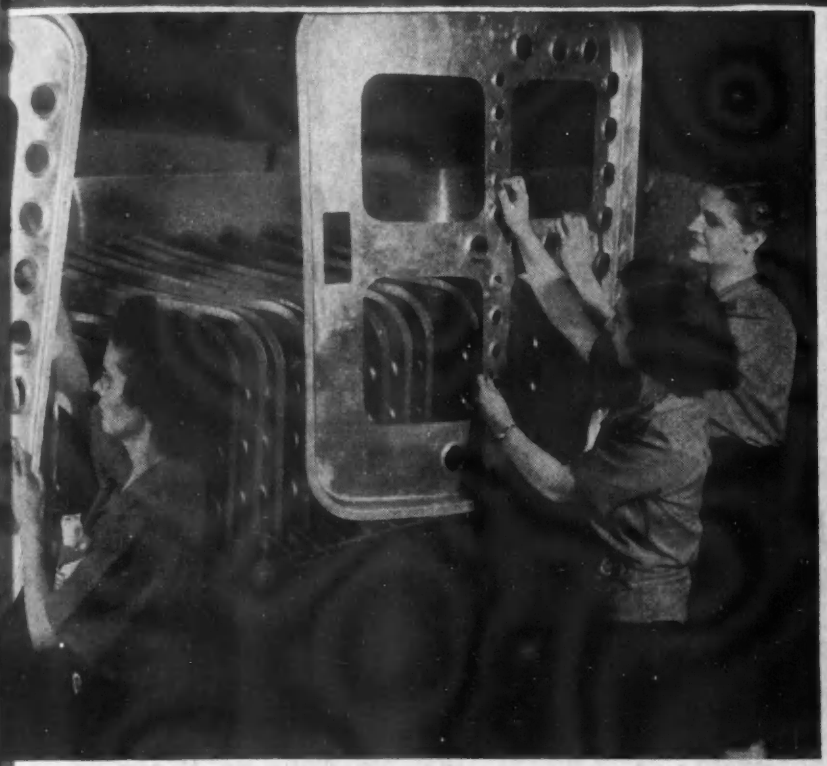
Manufacturers of Equi-Poise and Tru-Pitch marine propellers from 4 inches to 12 feet diameter; Equi-Flex cushion stuffing boxes and shaft logs; struts, rudders, propeller shafts.



FEDERAL-MOGUL

SLEEVE FEDERAL Mogul **BEARINGS**

REYNOLDS ...can supply vitally needed parts NOW



No part is too small or too large for the complete Reynolds facilities. All parts are subjected to rigid inspection as a normal routine of manufacture and stamped with the customer's assembly code numbers. Carefully compiled tally sheets systematically record the shipment of all parts. There is no confusion or delay in assembling Reynolds parts.

FORWARD-LOOKING MANUFACTURERS recognize their acute need of thoroughly dependable sources of supply in the midst of today's uncertainties and changing conditions. Reynolds is just such a supplier, where aluminum parts are concerned . . . whether the order calls for the speedy delivery of a few hundred or a million.

These past few years have given Reynolds a post-graduate course in fast, economical parts manufacture. The lash of war "must" orders produced aluminum parts by the hundreds of thousands . . . parts of every conceivable size and shape—from small angle brackets and sub-panels to complete wing and cabin segments. Reynolds pre-fabricated aluminum parts lowered the cost and speeded the manufacture of planes, tanks, ships and the thousand-and-one devices that go into these weapons.

Reynolds facilities are complete in every respect . . . from the bauxite mines to finished aluminum parts. Batteries of modern high-speed machines, manned by skilled operators, are now available to manufacturers with suitable allocations.

Parts can be fabricated to the most strict specification, or when desirable, Reynolds engineers are ready to work with manufacturers to determine the best application of the new Reynolds-developed aluminum alloys to the specific job at hand. No part is too large or too small for the Reynolds production facilities.

Why not investigate what Reynolds can do for you *now?* Reynolds Metals Co., Aluminum and Parts Div., Louisville, Kentucky.

* * * .

SALES OFFICES IN THE FOLLOWING CITIES: Akron, Ohio. Atlanta, Ga. Baltimore, Md. Beverly Hills, Calif. Boston, Mass. Buffalo, N. Y. Chicago, Ill. Cincinnati, Ohio. Cleveland, Ohio. Dallas, Texas. Dayton, Ohio. Detroit, Michigan. Kansas City, Mo. Milwaukee, Wisc. Minneapolis, Minn. New Orleans, La. New York, N. Y. Philadelphia, Pa. Pittsburgh, Pa. St. Louis, Mo. San Francisco, Calif. Toledo, Ohio. Washington, D. C. Wichita, Kansas.

REYNOLDS METAL

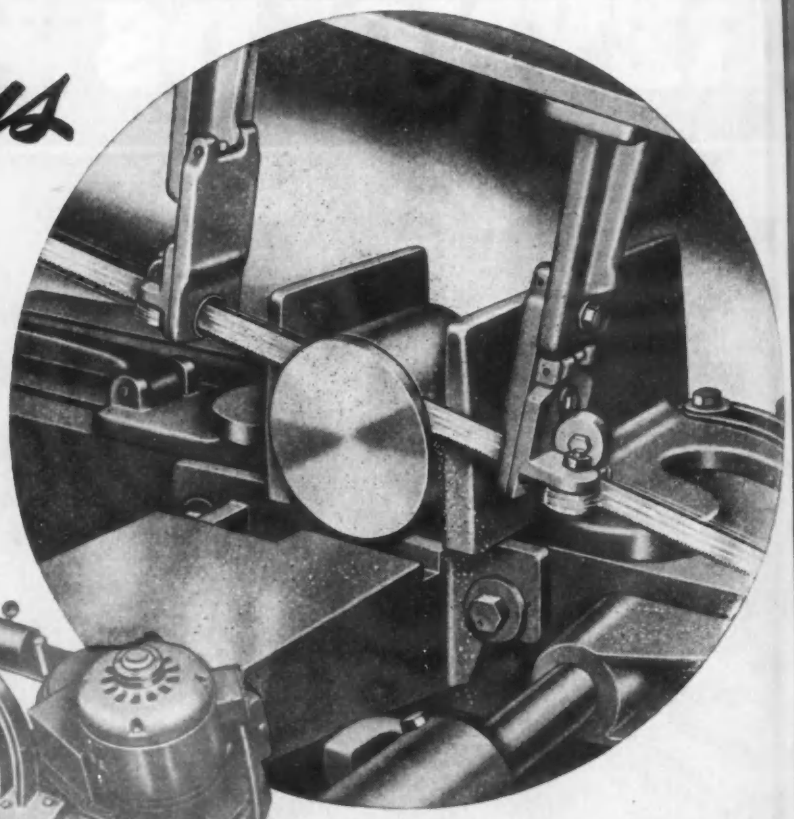
REYNOLDS ALUMINUM

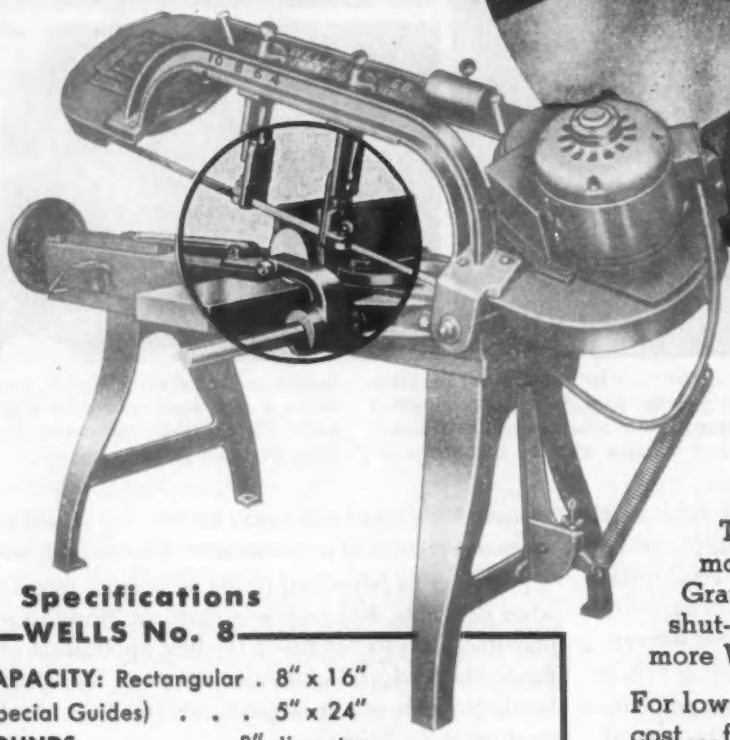
The Great New Source of

SHEET · EXTRUSIONS · WIRE · ROD · FORGINGS · TUBING · COIL · BOWDS

STEP UP PRODUCTION *with*

Continuous Cutting the WELLS WAY





An all-purpose metal-cutting saw, the Wells No. 8, can be used on production, in stores, toolrooms or on maintenance for dependable service in the cutting of metals.

Three-speed selection provides the most efficient cutting speed operation. Gravity controlled feed and automatic shut-off permit one person to keep 2 or more Wells Band Saws in operation.

For low first cost, installation cost and power cost... for a long service life with a minimum of maintenance use a Wells No. 8.

See your distributor or write direct for complete details.

Specifications
WELLS No. 8

CAPACITY: Rectangular . 8" x 16"
(Special Guides) . . . 5" x 24"
ROUNDS: . . . . 8" diameter
MOTOR: . . . . . 1/2 H.P. current optional
SPEEDS: . . . Selective 60, 90, 130 ft. per min.
WEIGHT: . . . . . Approximately 750 pounds

Wells SAWS
THE SIGN OF SERVICE

Wells

Products by Wells are Practical

METAL CUTTING BAND SAWS

WELLS MANUFACTURING CORPORATION
101 JEFFERSON ST., THREE RIVERS, MICHIGAN

Signal Corps Photo

THE ARMY "MECH'S" GRIP OF STEEL

It's a simple little tool—a pair of pliers—that gives our army airplane, tank and auto mechanics the grip of steel needed to quickly and easily tighten, loosen, twist, bend or cut parts and materials.

Thousands of pairs of pliers now in use on far-flung battlefronts are made of Republic Electric Furnace Steel.

As produced by one manufacturer, 23 operations are required in addition to forging. Steel cost is only 10% of the production cost. Thus the steel must be uniformly sound in structure —uniform in grain size—uniformly clean and free from inclusions—uniform in hardenability—uniform in strength—to insure against imperfections that would cause rejection at final inspection and loss of the high-percentage overhead and labor cost.

Republic Electric Furnace Steels are as CLEAN and SOUND as the most expert furnace practice and long experience can make them. They are *consistently* and uniformly homogeneous—free from practice-upsetting variables. Thus they insure maximum benefits from mass production methods.

And these "targeted" steels are accurately aimed at narrow specifications —then held to that mark *precisely* by the close control possible only in electric furnace melting.

Republic Electric Furnace Steels can help YOU produce items that will bring profits in competitive peacetime markets. To this end, Republic offers you its unequalled experience and increased capacity as the leader in this field of steel-making. Write us.

REPUBLIC STEEL CORPORATION
Alloy Steel Division • Massillon, Ohio
GENERAL OFFICES • CLEVELAND 1, OHIO

Berger Manufacturing Division • Culvert Division
Niles Steel Products Division • Steel and Tubes Division
Union Drawn Steel Division • Truscon Steel Company
Export Department: Chrysler Bldg., New York 17, N. Y.

REPUBLIC
—Leader in the Production of
ELECTRIC FURNACE STEELS
"QUALITY" steels . . . alloy . . . stainless

LAST TIME FOR A LONG TIME!

Because This Time He's Replacing With Long-Life Service "ForgeWelds"

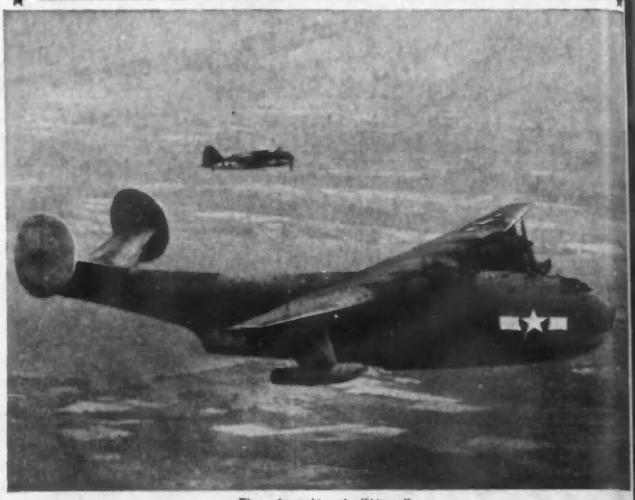
● To save time spent replacing casters that just can't stand constant pounding, replace with Service Heavy-Duty "ForgeWelds." You'll replace fewer in the long run. These casters are really tough—built to carry your heaviest loads with no attention except occasional greasing. As an extra dividend, you'll find trucks, trailers and other hauling units moving with new liveliness and speed.

- **UNBREAKABLE—** As shown, top plate and king bolt are a single piece, drop forged from SAE-1045 steel.
- **INSTANT SWIVEL—** Double circle of balls in machined raceways of 230 Brinnell hardness.
- **EASY ROLLING—** Hyatt Roller Bearings in wheels.
- **LUBRICATION:** High pressure type.
- **CAPACITY:** 6,000 to 8,000 lbs. per set of 4.
- **WHEELS:** Your choice of Ni-Steel-Iron or floor-protecting molded plastic.

SERVICE CASTER & TRUCK DIVISION
OF DOMESTIC INDUSTRIES, INC.
678 N. Brownswood Avenue, Albion, Michigan
Eastern Factory: 449 Somerville Ave., Somerville (Boston) Mass.
Toronto, Canada: United Steel Corporation, Ltd., SC&T Co. Division

SERVICE

Trucks, Casters and Specially Designed Lifting and Hauling Units



The giant Martin "Mars"

TAYLOR FIBRE FLIES WITH THE MARS

The Navy's great flying boat, the Mars, built by The Glenn L. Martin Company, shattered all existing records for cargo transportation and over-water flight when it took to the air with almost 75 tons gross weight.

Primarily designed as a cargo plane, everything possible was done to increase payload by reducing dead weight. Into this scheme of things, Taylor Phenol Fibre and Vulcanized Fibre fit perfectly, for these two products are famous for their ability to provide a high degree of strength with unusually light weight.

Taylor's broad, wartime aviation experience can be useful to airplane manufacturers whether they have their noses to the grindstone of today's production, or their eyes focused on the post-war planes of the near future.

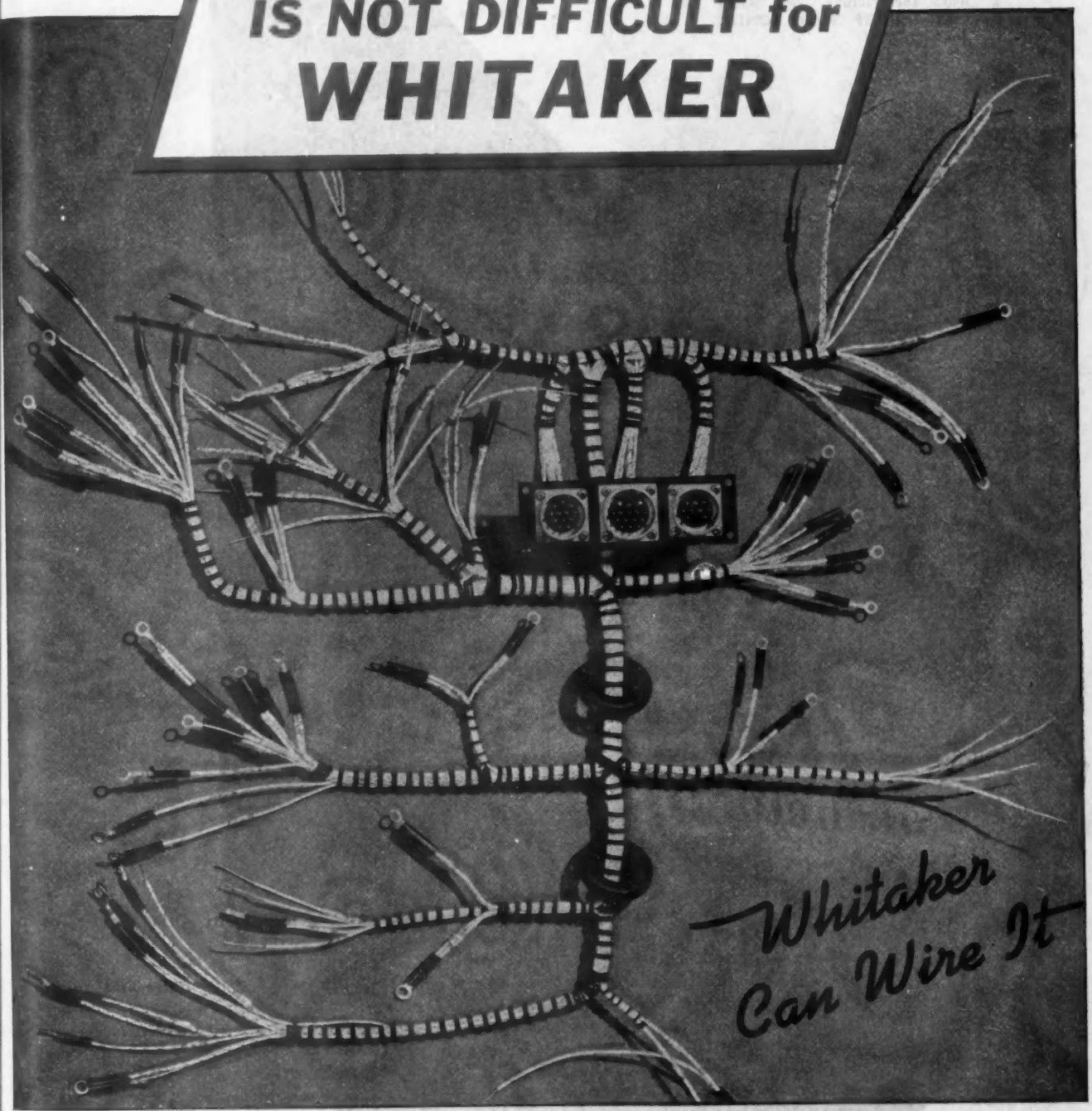
Don't make the mistake of assuming "it can't be done with fibre" until you've given Taylor engineers a chance to look at your blueprints. Write to us today, in complete confidence, and without obligation.

TAYLOR FIBRE COMPANY

LAMINATED PLASTICS: PHENOL FIBRE • VULCANIZED FIBRE
Sheets, Rods, Tubes, and Fabricated Parts

Norristown, Pennsylvania • Offices in Principal Cities
Pacific Coast Headquarters: 344 S. San Pedro St., Los Angeles

DOING THE "UNUSUAL" IS NOT DIFFICULT for WHITAKER



Send us blueprints of your requirements covering--

- **WIRING HARNESSES**
- **BONDING JUMPERS**
- **CABLE ASSEMBLIES**
- **AIRCRAFT and RADIO CABLE PRODUCTS**

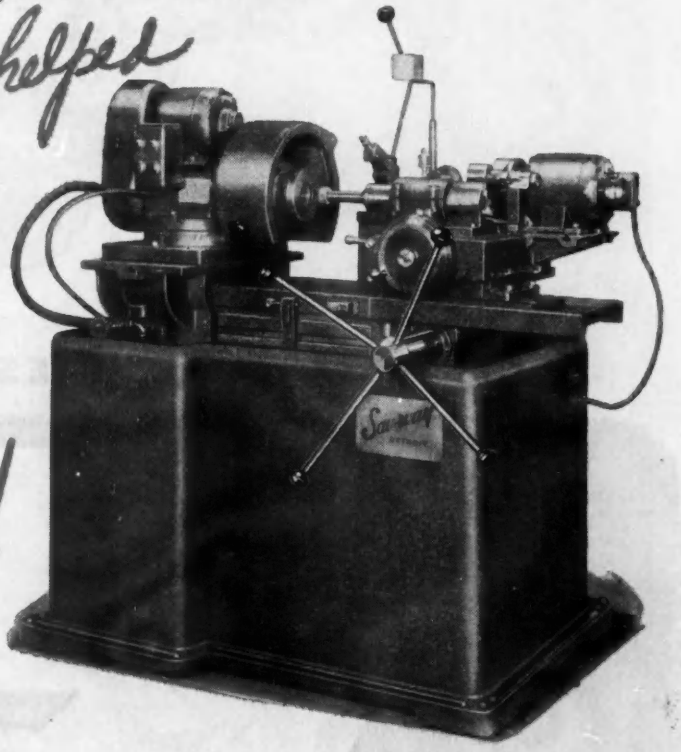
Above is illustrated one of many complicated wiring assemblies turned out by Whitaker. It serves as tangible proof of the statement that "doing the unusual is not difficult for Whitaker." Many other examples could be cited covering our production of cable products for automotive, aircraft, marine and radio equipment . . . Regardless of whether your wiring requirements are immediate, or for the future, it will pay you to get in touch with us. You will find that we have the "know-how", skilled manpower, and ample plant facilities for a big volume of wartime and post-war production . . . Your inquiries are solicited.

WHITAKER CABLE CORPORATION

General Office: 1305 Burlington Avenue, Kansas City 16, Missouri
Factories: Kansas City, Mo. • St. Joseph, Mo. • Philadelphia • Oakland

Production America!

The machine you helped design and prove in round-the-clock punishment of war production. Available for Quick Delivery!



This Sav-Way multi-purpose internal grinder has 17 specific features—the features which you production men have asked for. Neoprene insulated against vibration, distortion, mis-alignment. Equipped with the famous Gold Seal Spindle—the spindle that breathes! Combines accuracy and stamina with the speed, flexibility, and wide range adaptability so necessary in the coming period of change-over and new product development. The coupon will bring complete description, specifications and prices.

CLIP THIS COUPON TO YOUR LETTERHEAD

Sav-Way Industries, Box 117, Harper Station, Detroit 13, Michigan

Kindly send me a copy of the illustrated folder describing the Sav-Way M-1-A Internal Grinder.

Mail to the attention of:

Mr. _____

Position _____

Sav-way INDUSTRIES

Machine Tool Division

BOX 117, HARPER STATION, DETROIT 13, MICH.

BUILDERS OF HAND AND HYDRAULIC INTERNAL GRINDERS • PRODUCERS OF GOLD SEAL SPINDLES
PLUG GAGES • MICROMETER CHECKERS • PRECISION AIRCRAFT, AUTOMOTIVE, AND ORDNANCE PARTS

NOTHING BABIES PASSENGERS...

Making vehicles comfortable is *your* business. Making the seats more restful is *our* business.

Foamex seat cushioning babies passengers like *nobody's* business. They don't just sit on this wonderful latex foam. They *float* on millions of buoyant, air-breathing cells.

Every one of those cells is a little air-valve shock absorber. Every one says "no admittance" to vibration.

Every one breathes to keep seats (and passengers) air-cooled, fresh and dainty.

These cells, plus the natural resilience of latex, make seats fit passengers better—instead of squashing passengers' flesh to fit the seats.

And *Foamex* wears years longer. A *Foamex* seat never needs restuffing. There's no stuffing in it. No springs either. *Foamex* replaces both with one molded, sag-proof unit.

Sorry, you can't have *Foamex* for civilian use right away. It's strictly military. But you can put *Foamex* into postwar comfort plans. Remember, it's more restful—it's more efficient—it's made only by Firestone.

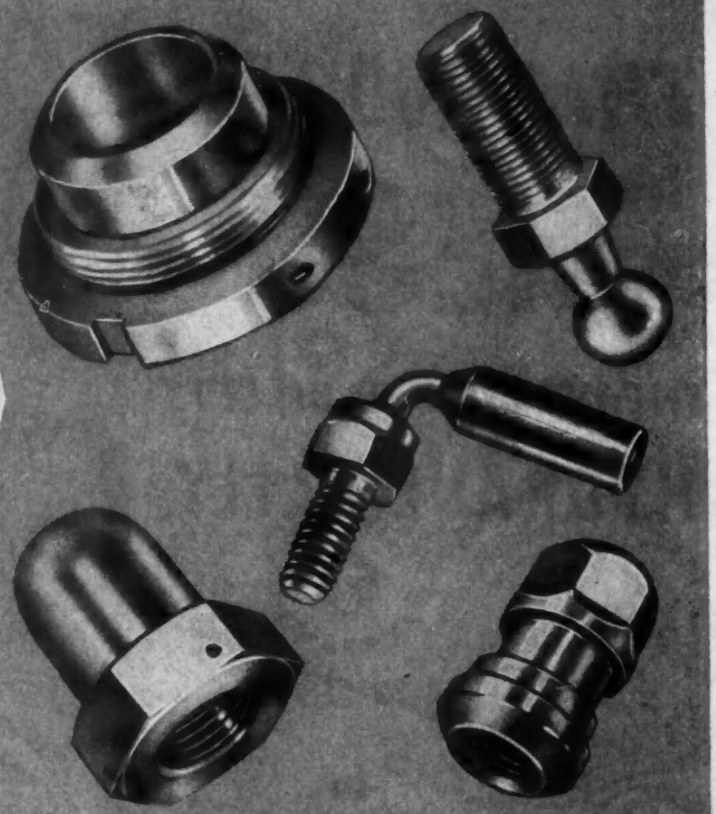
P.S. The ideal covering for *Foamex* seats—*Velon**, Firestone's new wonder fabric. Makes smarter colors practical.

For the best in music listen to the Voice of Firestone, Monday evenings over the entire NBC coast-to-coast network.

*TRADE MARK

ANOTHER CONTRIBUTION TO A BETTER WAY OF LIFE by **Firestone**

Need Parts Like These?



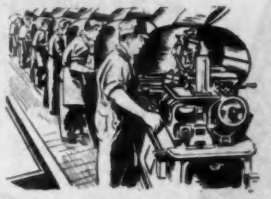
Come to Tourek

These are typical precision screw machine parts. Tourek can make them *exactly to your specifications* . . . in any size from 1/16" to 2 5/8" . . . in any metal . . . in any quantity.

Here at Tourek to supply these custom parts is an organization coordinated to serve. An organization complete and modern in *equipment* . . . ingenious in *engineering "know-how"*. . . and rich in manufacturing *experience.*

Although present production demands are today engaging our facilities, we are eager to serve you. Why not consult us—particularly on your postwar screw machine parts problems?

TOUREK'S EQUIPMENT
Tourek's modern plant is equipped with the latest model automatic screw machines, all necessary supplementary equipment and complete tool room facilities.



TOUREK'S INGENUITY
Tourek's Engineering Staff works closely with you to devise the most effective design and economical production of precision parts.

TOUREK'S EXPERIENCE
To the solution of your special problems Tourek brings to bear nearly a quarter of a century of successful, volume manufacture of screw machine parts of the most intricate design and precise dimensions.

MAKERS OF THE FAMOUS TOUREK BALL JOINTS

ESTABLISHED 1920

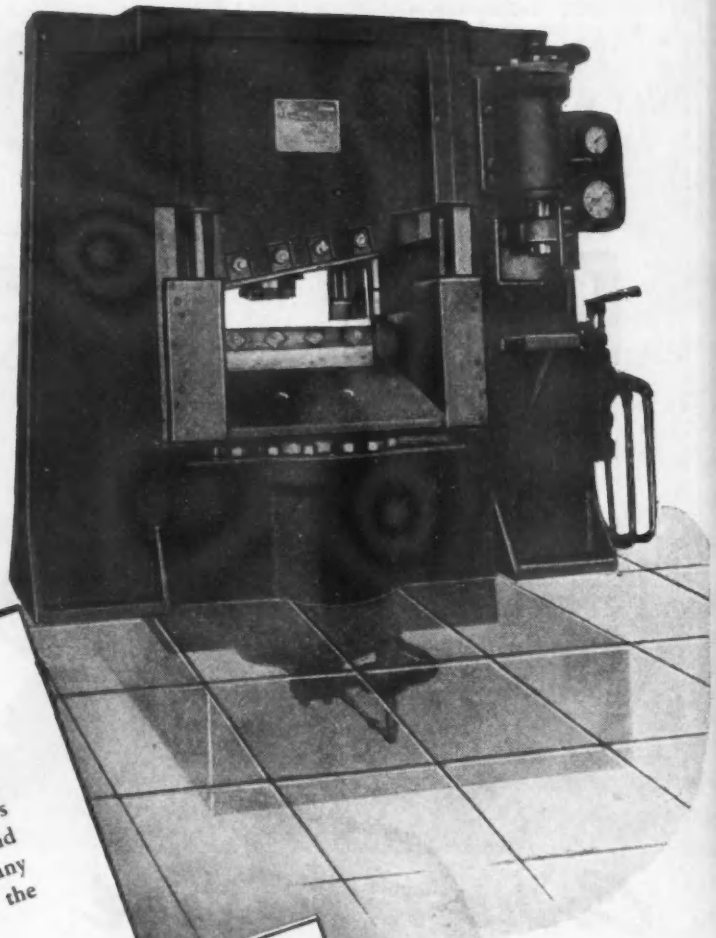
J. S. TOUREK MFG. CO.

PRECISION SCREW MACHINE PARTS

4701 West 16th Street Chicago 50, Illinois

THIS 600 TON PRESS

SHEARS COPPER BILLETS HYDRAULICALLY



Watson-Stillman hydraulic metal shearing machines have made it possible for war-geared industry to meet ever-increasing production schedules. In this highly-mechanized war, metal working is playing a major role behind the firing line, and Watson-Stillman hydraulic machinery—of many types and for many uses—has been right in the thick of the "production front."

Shown above is the latest Watson-Stillman 600-ton, self-contained Hydraulic Copper Billet Shear capable of shearing non-ferrous metal billets having a cross-section of 3 inches thick by 16 inches wide, and a shearing strength of 45,000 pounds per square inch. It operates at an advance and shearing speed of 63 inches per minute, and return speed of 250 inches per minute.

POST-WAR PROBLEMS are going to be easier to solve because of the technical advantages gained by the necessities of war-time production. Watson-Stillman engineers, backed by almost a hundred years experience in the manufacture of hydraulic machinery, offer you their services NOW, so that you can be prepared for the post-war problems of your industry. Now is the time to ask for Watson-Stillman advice. The Watson-Stillman Co., Roselle, N. J.

WATSON-STILLMAN

Hydraulic Equipment, Valves
Forged Steel Fittings

3824

THEN TRACTOR-TRAILERS WILL BE

Braked Electrically

IT was a surprise dawn attack! Scores of huge artillery pieces were wheeled into position down tortuous mountain slopes and over the punishing deserts of Africa. Tons of guns always under complete control—eased along or stopped short by Warner Electric Brakes. Yes, modern tractor-trailers and many other types of power equipment will be *braked electrically* after the war. Warner Electric Brakes, performance-proved on thousands of essential motor transports and artillery pieces in grueling war service all over the world, will be available for a wide range of new applications.

Warner Electric Brake Mfg. Co.
Beloit, Wisconsin

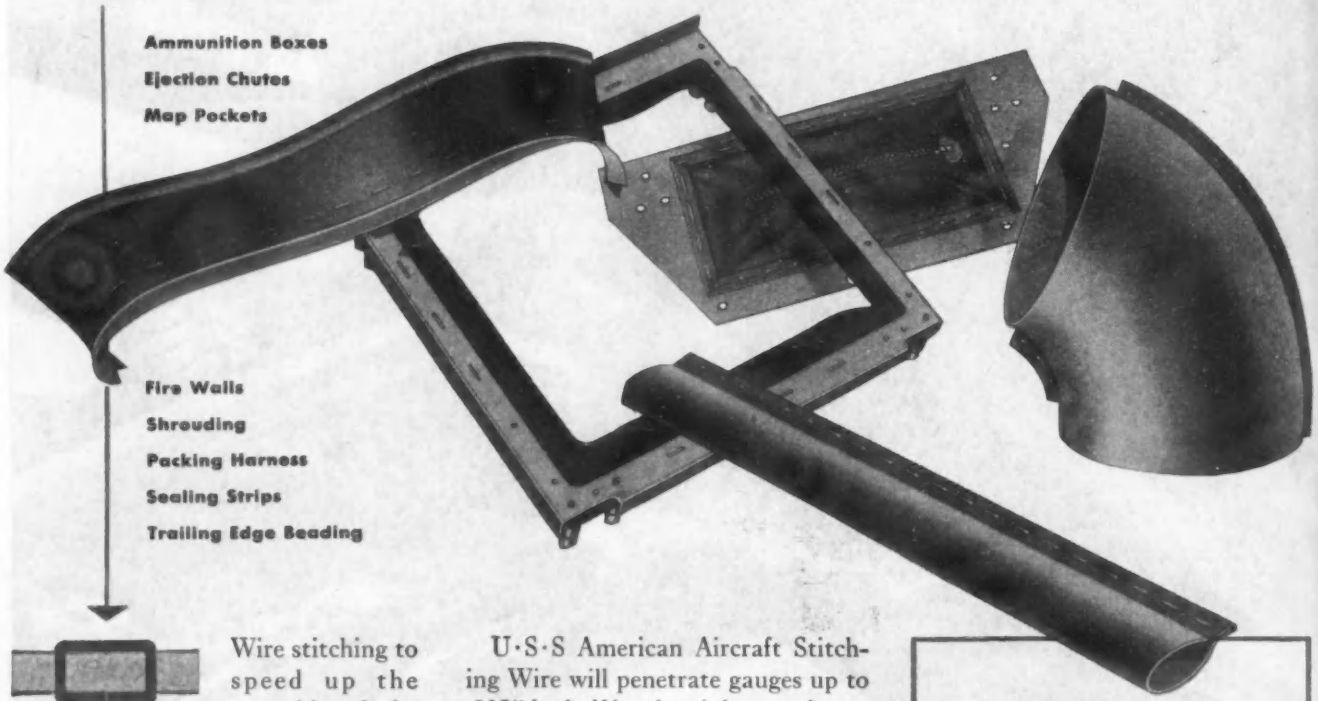
BUY WAR BONDS

WARNER
ELECTRIC BRAKES

CONTROLLED SPLIT-SECOND STOPPING POWER FOR ANY PURPOSE

ASSEMBLE THEM FASTER . . . AND CHEAPER

Stitch 'em with Wire!



Wire stitching to speed up the assembly of airplane and glider parts has advantages over both riveting and welding. It increases production. It lowers cost. It does not require skilled labor.

U·S·S American Aircraft Stitching Wire is tough and ductile enough to form sharp, tight corner bends so that it clinches flat on the underside to provide full bearing on the material. Yet it is so hard that it actually punches a clean slug out of the base metal about the size of the wire itself. Thus it produces a clean hole—with no tearing puncture in the base material nor burring of the hole. No cracking of the material occurs with attendant notch effect that localizes stresses under various load factors.

U·S·S American Aircraft Stitching Wire will penetrate gauges up to .035″ for half hard stainless steel—up to .060″ for SO aluminum and up to .040″ for 24ST aluminum. It is heavily coated with a tightly adhering zinc coating to withstand a minimum of 300 hours salt spray test.

Proved under the toughest operating conditions, this high carbon steel wire is .051″ size (with all tolerances under) and has a minimum tensile strength of 290,000 lbs. per square inch. It is put up on 5 and 10 lb. cores ready for mounting on stapling machines. (A 5-lb. core of American Aircraft Stitching Wire makes approximately 10,000 stitches.) We welcome the opportunity of discussing the application of this product to your wire-stitching needs.

ADVANTAGES

Strongly joins metal to metal, or metal to rubber, wood, asbestos, fabric, leather and plastics - without backing strip.

Requires less highly skilled workmen.

Stitches can be applied about 10 times as fast as rivets — about twice as fast as welding spots.

Faying surfaces may be painted before fastening.

Work need not be cleaned before fastening.

Mating and clamping of work is less critical.

Inspection time and skill required are reduced.

Flange distance can be reduced.

Power requirements and initial cost of stitching equipment are considerably lower than for any type of welding.

AMERICAN STEEL & WIRE COMPANY

Cleveland, Chicago, and New York

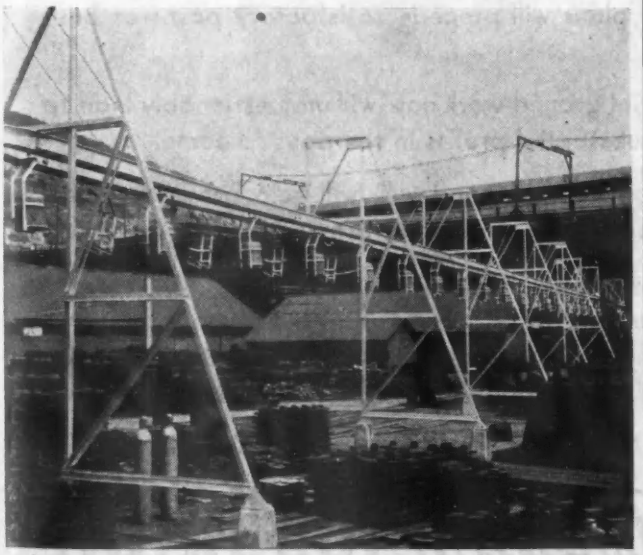
Columbia Steel Company, San Francisco, *Pacific Coast Distributors*
United States Steel Export Company, New York

U·S·S AMERICAN AIRCRAFT STITCHING WIRE

UNITED STATES STEEL

Solving Tomorrow's Handling Problems *Today*

From the start of this national emergency, Mathews Engineers have burned the midnight oil. Huge layouts, new handling problems, very special devices — and every system vitally needed as quickly as possible. Brass and aluminum, ship and tank plate, aircraft parts and motors, shells and bombs — all had to be handled in quantities up to that moment unheard of. Many normal years of experience have been gleaned from these few months of activity. The ingenious developments in conveying these special materials will serve industry well in the peacetime years ahead, for the more highly developed the manufacturing and materials-handling phases of production become, the greater the number of people who can enjoy the advantages the product affords. It can be profitable to take advantage of the experience of Mathews Engineers. Their service is available in principal cities in the United States and Canada.



Mathews Conveyer Company

ELLWOOD CITY, PENNSYLVANIA

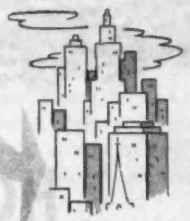
Now- **3 NEW STANDARD MOLDING OFFICES**

to Better Meet Your War and Post-War Needs

for INJECTION PLASTIC Parts and Products

NEW YORK

Office and Factory Address in Dayton Remains Unchanged



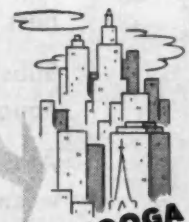
DETROIT

Manufacturers in all industries in these areas who are interested in the use of injection molded plastic parts and products may now submit their prints and specifications *direct* to the new Standard Molding offices listed below. These new offices have been established to meet the increased demand for precision injection molded plastic parts in these areas . . . and to expedite service and delivery of Standard products.

Standard's injection molded plastics, already used extensively throughout the automotive-aircraft industries, maintain minutely accurate tolerances, are exceptionally long-wearing . . . durable. An economical application of injection molded plastics may improve your production —now, as well as after the war — and effect a worthwhile conservation of weight, labor and critical metals.

Standard Molding Corporation, a pioneer in the injection plastics field, invites you to use its specialized engineering knowledge and experience, its research and manufacturing facilities.

Blueprints submitted for our study will be safeguarded carefully.



CHATTANOOGA

NEW YORK — R. S. Christie Co., 175 Fifth Ave., New York, N. Y., Phone Gramercy 7-8929.

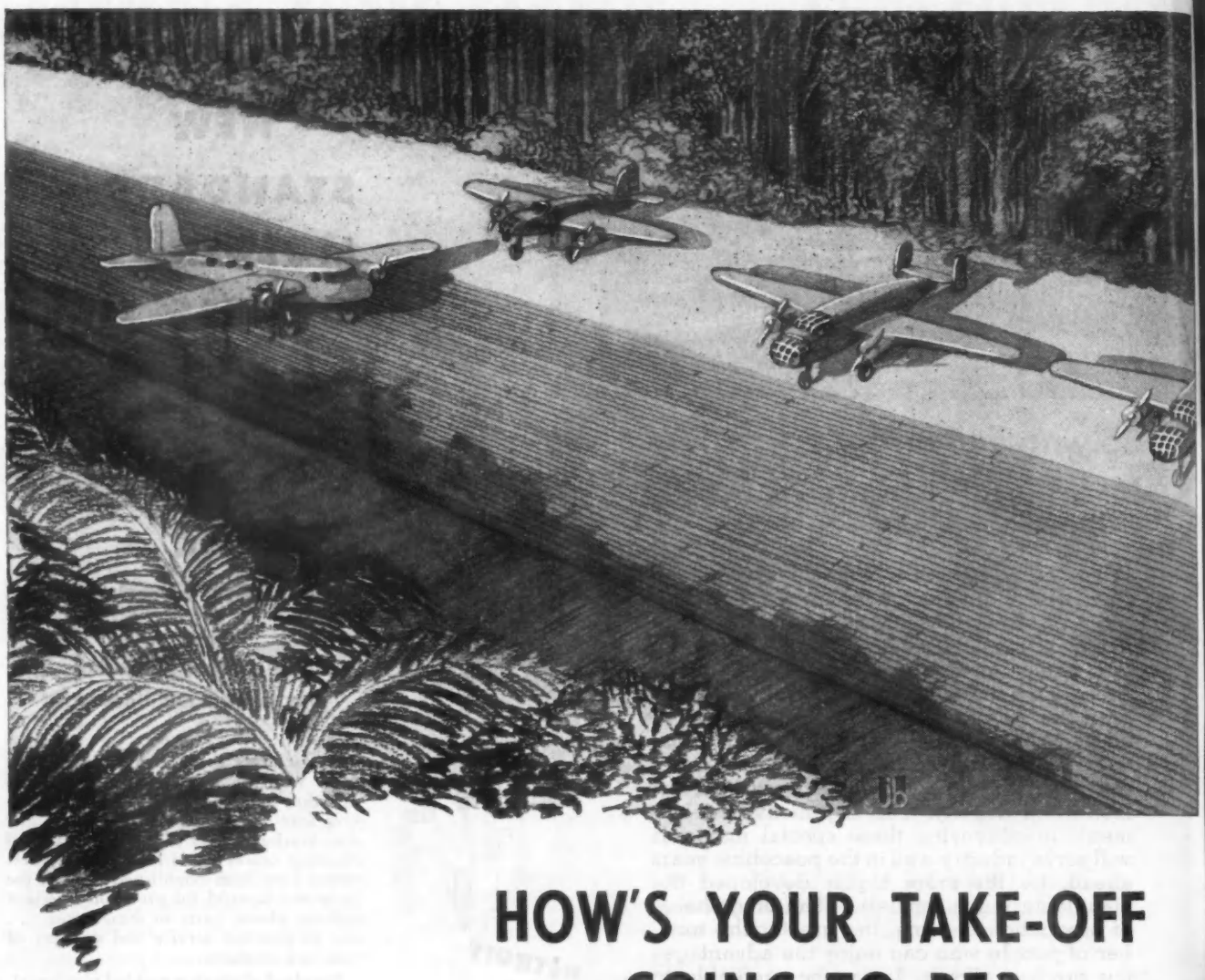
DETROIT — Standard Molding Corp., 6452 Cass Avenue, Detroit 2, Mich., Phone MAdison 6300.

CHATTANOOGA—Standard Molding Corp., 324 Chattanooga Bank Bldg., Chattanooga, Tenn.

THE Standard **MOLDING CORPORATION**

DAYTON 1, OHIO

PRODUCTION DESIGN SERVICE



HOW'S YOUR TAKE-OFF GOING TO BE?

Just as air strips precede useable air fields, practical post-war plans will precede satisfactory post-war business.

Substantial ground-work now will unquestionably lead to equally substantial profits in the days to come.

Also a backlog of good will, will help provide volume when it is needed—needed to provide jobs for ex-service men.

For these, and other good reasons, present indications are that more manufacturers will advertise in AUTOMOTIVE and Aviation INDUSTRIES this year, than ever.

A CHILTON Publication

AUTOMOTIVE *and Aviation* INDUSTRIES

Chestnut and 56th Streets
Philadelphia 39, Pennsylvania

THE METAL INDUSTRY AND ITS FUTURE

Design for Tomorrow

ATTEND THIS YEAR'S METAL CONGRESS
OCTOBER 16-20 IN CLEVELAND

In Cleveland's big Public Hall this October 16th, the metal industry will meet to take stock of its present tremendous fund of information during the 26th annual National Metal Congress and War Conference Display.

To knit together these developments of the war years as a compact design for tomorrow, some 30,000 metal men will attend this five-day meeting. They will see more than 300 exhibits devoted to new improvements in metals, processes, products and equipment.

They will hear more than 150 technical and practical lectures prepared by nearly a thousand metal experts under the direction of five great national societies. This is the metal industry's 26th annual postgraduate course on metals, with the emphasis this year on the design for tomorrow.

You are cordially invited to attend.

Your only entrance fee will be your interest in metals. Pack your problems — come prepared to partake of the expert knowledge available — to participate in wide-open technical sessions. Come prepared to see scores of operating exhibits and to discuss what's new with the engineering experts of more than 300 companies.

Make your hotel reservations now through the Housing Bureau, c/o Cleveland Convention & Visitors Board, 1604 Terminal Tower, Cleveland 13, Ohio.

For Exhibit Space

Certain choice display spaces are still available even though 300 companies have already reserved space. For complete information on displays, wire collect to American Society for Metals, 7301 Euclid Avenue, Cleveland 3, Ohio.

NATIONAL METAL CONGRESS

CLEVELAND'S *Public Hall*

OCTOBER 16 THRU 20, 1944

AND WAR CONFERENCE DISPLAY

Sponsored by the American Society for Metals, in cooperation with the American Welding Society, the Iron and Steel and Institute of Metals divisions of the American Institute of Mining and Metallurgical Engineers, the American Industrial Radium and X-Ray Society and the Society for Experimental Stress Analysis.

New Products

(*Continued from page* 112)

has twice the yield strength of common structural steel. In extruded shapes, such as those used in aircraft wing beams, the new alloy has a tensile strength of about 88,000 psi after heat treatment. Under the same conditions, it has a yield point of approximately 80,000 psi. In the form of alclad sheet, such as would be used for the skin of planes, it has a yield strength of about 67,000 psi.

Fibron Tape is Versatile Insulator

"Fibron," a many-purpose plastic tape of widely divergent applications, is now in production at Irvington Varnish & Insulator Company, Irvington, N. J. It is used for insulating wires, cables and electrical equipment; for splicing cables; and for protecting wiring, piping, and equipment exposed to caustic or corrosive fumes, oil, grease, acids, alkalis or moisture.

Fibron Tape is manufactured from "Vinylite" resin, a product of the Carbide and Carbon Chemicals Corporation. It is heat-sealing, flame resistant, and high in dielectric and mechanical strength.

Corrosion Preventive Filter and Sprayer

The Hilco corrosion preventive filter and sprayer, a product of The Hilliard Corporation, Elmira, N. Y., is used for spraying rust and corrosion preventives on metal surfaces, including internal mechanism of aircraft engines when preparing them for storage and shipping. The Hilco unit consists of a tank into which the liquid rust and corrosion inhibitor is placed and a filter equipped with heaters for warming the fluid to insure free flowing. A high pressure motor driven pump draws the fluid through the filter and delivers it through a length of hose at the end of which there is attached a spray nozzle.

AC-DC Electrodes

The Alloy Rods Company, York, Pa., offers a stainless steel arc welding electrode that is said to perform equally well on alternating or direct current in all positions. The maker states that these AC-DC electrodes, which are available in all stainless steel analyses, have exceptionally low spatter loss, easily removed slag and instant arc establishment.

Ward LaFrance Builds Army Heavy Wrecker

(*Continued from page* 25)

ized heavy duty vehicles ranging in capacity from seven tons and upwards.

As mentioned earlier, the physical plant is composed of a group of individual buildings, each one housing some portion of the departmental setup. One building, houses the machine shop frame assembly, and the welding department. The machine shop has been modernized by the installation of a battery of Cincinnati heavy-duty Hydro-Matic milling machines, a Bullard V-T-L, a Cincinnati single-spindle Hydro-Tel, American Hole-Wizard and Radials, Grinding and modern sheet metal and tool-room machines.

The welding department produces a large variety of fabricated sub-assemblies which are built-up by welding castings and forgings to formed steel plate sections. Steel plate is cut to form on the Airco automatic flame cutting and Kling Bros. rotary cutting, flanging and offsetting machines. The welding is done in booths, using Hobart portable arc-welders.

The chassis frame department handles frame assembly. Here the rails and cross-members are drilled to templates, then hot-riveted, using the prepared weldments and sub-assemblies.

Another building houses the major sub-assembly department for engines and axles. Engines are fitted on a conveyor line where the operators attach the accessories, clutch and transmission, and prepare the engine for installation in the chassis. Another group, on the axle line, installs the springs, brackets, and other attachments, and assembles complete rear axle bogies.

Adjacent to the sub-assembly is the final assembly department with two parallel conveyor lines. Here the vehicle is integrated completely except for the body and its accessories. Following assembly, the vehicles move through a paint spray booth, and upon emerging from the booth they are run-in at the end of the line so as to establish lubrication of the engine, transmission, and the entire power train.

The vehicle is then ready for inspection and road-testing without load for preliminary acceptance. Following the road test, the vehicles come into the service department for such adjustments and repairs as may have been indicated by the tester.

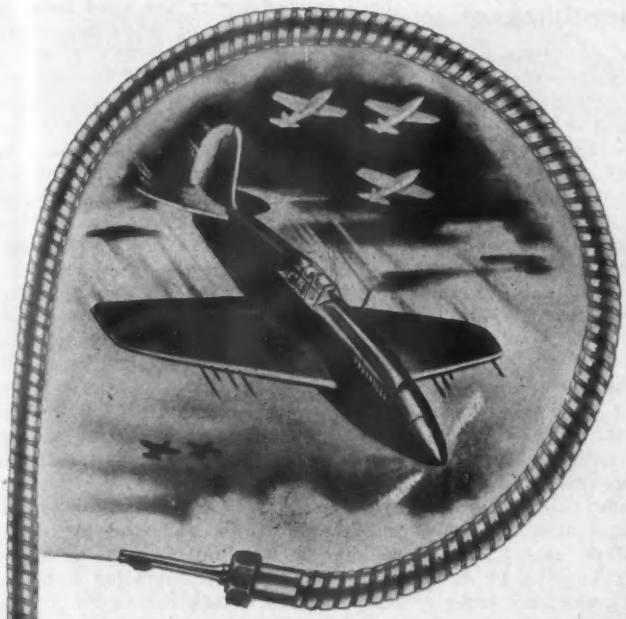
For the final acceptance test, the vehicles are road-tested with load, using 10-ton concrete blocks. As illustrated, the blocks are suspended from overhead rails and are dropped onto the chassis in preparation for the road test. This procedure, developed by Ward LaFrance, is said to be unique in the industry. Upon completion of the test, the vehicles again return to the service department for adjustments and repairs. If major repairs are required, the road test is repeated.

Meanwhile, cab assemblies, bodies, and other accessories such as winches, hoist, etc., are prepared for installation in other departments. Cabs are received in fabricated form but require the installation of the instrument panel, instruments, windshield, wiring harness, etc.

Road-tested vehicles then enter the final assembly building where the body, crane and its accessories are installed. At one station, the cables for the winches and hoists is wound on. The painting of the vehicle is then completed. In addition to the major accessories such as winches and hoist, the vehicle as delivered carries a great variety of tools and military equipment. Such items are installed in another building, making the vehicle ready for driveaway.

Another important stage in this process is the electrical testing of the complete vehicle to assure proper operation of field radio equipment, without interference. This is the familiar test for radio suppression which is carried on in a special booth.

In the main, materials handling is done by means of overhead hoists. For this purpose each building has been fitted with a series of overhead rails traversing the principal areas where



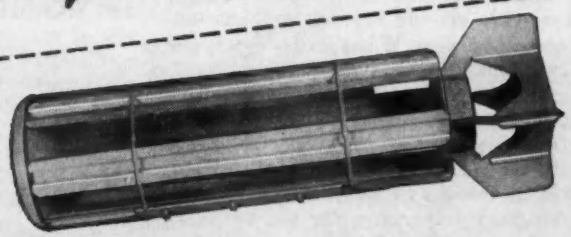
WHEN THE "LONGEST WAY 'ROUND IS THE SHORTEST WAY HOME"... Specify Walker-Turner Flexible Shafting

In transmitting light power loads between two points, it is often possible to design a simpler, lighter, more compact product with Flexible Shafting than with gears.

You'll find, too, that it pays to specify Walker-Turner Flexible Shafting on jobs like these — for smoother power flow, more sensitive control, trouble-free operation. Into this product, we've packed all the "know-how" picked up in years of manufacturing our own flexible shaft machines . . . in years of working with other manufacturers on problems of power transmission and remote control. Let us know if we can put that experience to work for you!

WALKER - TURNER COMPANY, INC.
Plainfield • New Jersey

CLUSTER of wartime ingenuities for *Your* postwar product



"PACKAGED METAL ENGINEERING*"

- ✓ CUTS PRODUCTION AND ASSEMBLY COSTS ON PARTS AND PRODUCTS
- ✓ SAVES MATERIALS AND WEIGHT
- ✓ IMPROVES UTILITY AND APPEARANCE

Here's a cluster of Grammes war production ingenuities that can be profitably utilized in the manufacture of your postwar product. The Aimable Bomb Cluster comprises 59 individual pieces that have been stamped, machined, coined, projection welded (4 sets of 6 welds in rapid sequence), and assembled into a group of 9 main units.

With 69 years of precision fabricating skills, cleverly devised assembly methods, and broad "know-how," Grammes can save you time, money and materials on your parts or product. The facilities listed provided a *centralized* set-up for efficient and economical precision fabricating and assembling.

STAMPING	ETCHING	LINE ASSEMBLY	DRILLING
DRAWING	TOOLS & DIES	MACHINING	WELDING
SPINNING	EMBOSSING	SPRAYING	PLATING
WIRE FORMING	LITHOGRAPHING	HARD ENAMELING	
ENAMELING	SCREW MACHINES	HEAT TREATING	

Grammes can be your *complete* manufacturing source, providing the all-inclusive services and facilities of "Packaged Metal Engineering"—**in one package . . . one service . . . we take over* ALL *responsibility, acting as* YOUR *factory, from Design Research to Drop Shipments.*

From idea development and product improvement to postwar manufacture, Grammes Contract Service facilities are available NOW for Research, Design, and Engineering. Let us work with you, complete confidence assured. Send today for our booklet—"Contract Service by Grammes"—address Dept. 11-8.

"MASTER CRAFTSMEN IN METAL"

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Oldsmobile CHEVROLET Mack

ALSO CREATORS OF DECORATED NAME PLATES • TRIMS • BEZELS • ESCUTCHEONS

assembly or sub-assembly work is done.

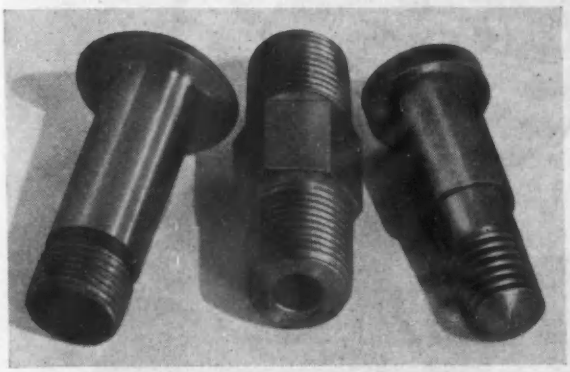
About 20 per cent of the dollar value of the product is represented by export-packed spare parts, comprising, concurrent spares, deficiency spares, replenishment and emergency spare parts. These materials are packed for export in accordance with Army specifications. However, one of the major contributions claimed by Ward LaFrance is the development of a system of re-usable crates for packing major units such as engines, transmissions, axles, etc. These are so designed as to protect the units while in transit; to serve as storage bins at the repair bases; and, what is even more important, for use in packing worn units which are consigned to overhaul depots or for return to the U. S. for rebuilding. Incidentally, it may be noted that the smaller packing boxes are used as bins for parts at the other end, thus dispensing with the establishment of formal stock rooms with racks and bins.

On the record this organization has done an outstanding job during the War with moderate new building construction and outlay for new equipment. The experience thus gained is expected to play an important role in the postwar development of heavy duty vehicles to be produced on a custom basis.

Regarding Superchargers

Wartime emphasis on engine performance has greatly stimulated interest in superchargers and while production today is devoted entirely to the war effort, the future holds many interesting problems of reducing costs and increasing efficiency through the use of supercharging wherever internal combustion engines are used. The supercharger has played an important part in the development of the airplane, particularly the high-altitude military planes.

According to E. W. Wasielewski, chief engineer of B-W Superchargers, Inc., supercharging of engines to give sea level power up to 12,000 ft. was fairly common at the outbreak of World War II. The war brought with it a need for large numbers of internal combustion engines for stationary, marine, and transportation uses. Maximum possible power had to be obtained from these engines and supercharging was the obvious solution of this requirement. McCulloch Engineering Corporation (now B-W Superchargers, Inc.), a pioneer in the production of centrifugal type superchargers for automobile engines, developed and produced the positive displacement supercharger which their engineers considered best adapted to these applications. Mr. Wasielewski said these superchargers are used today in a large number of engines, mostly Diesels, for high speed boats, landing craft, other marine uses, locomotives, and generating units for military installations of all kinds. The power of these engines has been increased by supercharging 20 to 30 per cent and in some cases, considerably more. A large proportion of four-cycle engines in military service are now supercharged. Although the increases in engine power so far developed by supercharging have been of moderate extent, there appear to be no obstacles to doubling engine power by this means, in Mr. Wasielewski's opinion. There are, however, some limitations on the amount that the power of engines can be increased by supercharging. This is particularly the case with the Otto cycle or gasoline engines, where manifold temperatures and pressures must be kept within limits except as higher octane fuels permit operation at higher temperatures. Another factor is strength of the mechanical parts. With constantly improving engine design, materials, and fuels, however, the supercharger will play an increasingly important role, according to Mr. Wasielewski, as manifold pressures rise. In many applications, the decreased cost of carrying around a smaller and lighter engine must be balanced against the cost of supercharging.



SPECIAL BOLTS AND STUDS

Uniform in strength, with precise, clean cut threads, and forged heads of any type or shape, RITCO Special Bolts and Studs can be made in any metal . . . ground or unground . . . in sizes up to 2" diameter. We are regularly supplying special bolts to fill the needs of the aircraft, marine, automotive and many other industries.

Remember RITCO *for*

SPECIAL BOLTS, NUTS & STUDS
DROP FORGING & DIE SINKING
SCREW MACHINE PRODUCTS
HEAT TREATING
SPRAYED METAL SERVICE
PARKERIZING

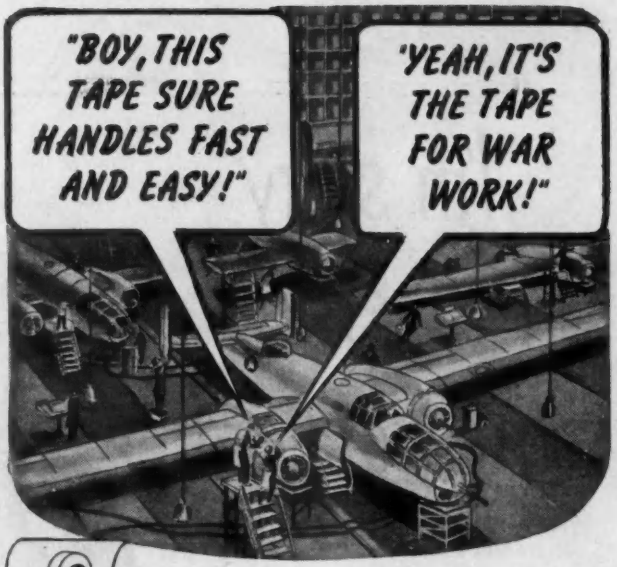
Estimates gladly submitted. Send samples or blueprints. Catalog on Request.

RHODE ISLAND TOOL COMPANY

148 West River St., Providence, Rhode Island

Serving American Industry Since 1834

RITCO



Something *new* in transparent, colored, multi-colored, or printed tape for every important war job. FILMONIZE pressure-sealing tape — easier to use — faster to apply — is speeding war production to every fighting front. The time-saver among tapes — FILMONIZE doesn't curl back or stick to itself. Off the roll and on the job instantly — conveniently — FILMONIZE keeps the war production line rolling!

Place a trial order now with your distributor and you'll see what we mean.

Filmonize Sets New Standards

- Easy to use . . . strips cleanly off the roll.
- No "curl-back" . . . no tangle . . . no waste.
- Fade-proof colors . . . printing sealed in.
- Widths from ½" to 18" throughout the Filmonize line.

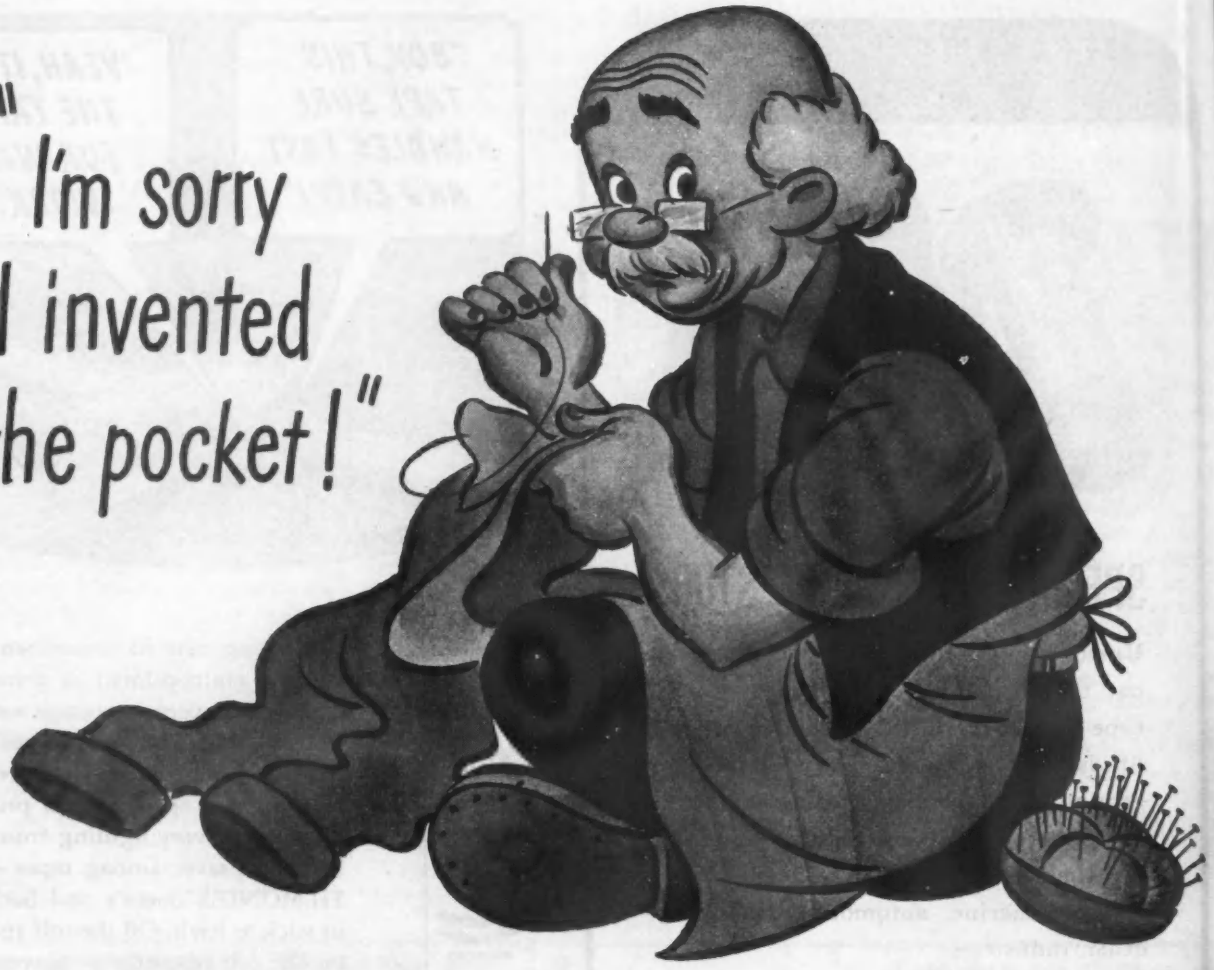
Filmonize

TRADE MARK REG.

SELF-SEALING TAPES

INTERNATIONAL PLASTIC CORPORATION MORRISTOWN, N. J.

"I'm sorry I invented the pocket!"



IF I HAD KNOWN that some Americans would be using pockets to hold all the extra money they're making these days I never would have invented them.

POCKETS ARE GOOD places to keep hands warm.

Pockets are good places to hold keys... and loose change for carfare and newspapers.

But pockets are no place for *any* kind of money except actual expense money these days.

The place—the *only* place—for money above living expenses is in War Bonds.

Bonds buy bullets for soldiers.

Bonds buy security for your old age.

Bonds buy education for your kids.

Bonds buy things you'll need later—that you can't buy now.

Bonds buy peace of mind—knowing that your money is in the fight.

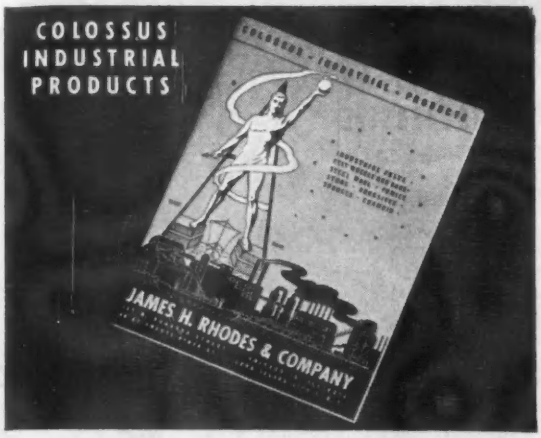
Reach into the pocket I invented. Take out all that extra cash. Invest it in interest-bearing War Bonds.

You'll make me very happy if you do.

You'll be happy too.

WAR BONDS to Have and to Hold

This is an official U. S. Treasury advertisement—prepared under auspices of Treasury Department and War Advertising Council



You Need This New Book!

This latest abridged text book will give you a new conception of how Colossus Products fit into wartime production . . . demonstrates how these RELATED products can serve you — efficiently in production department — conveniently in purchasing departments.

The 24 Rhodes engineer-representatives assure you quick consultation anywhere in the United States.

FELT WHEELS & BOBS	PUMICE STONE
INDUSTRIAL FELTS	ABRASIVES & ROUGES
STEEL WOOL	SPONGES & CHAMOIS

45 YEARS OF SERVICE TO INDUSTRY

JAMES H. RHODES & COMPANY

155 West Hubbard Street, Chicago 10, Illinois
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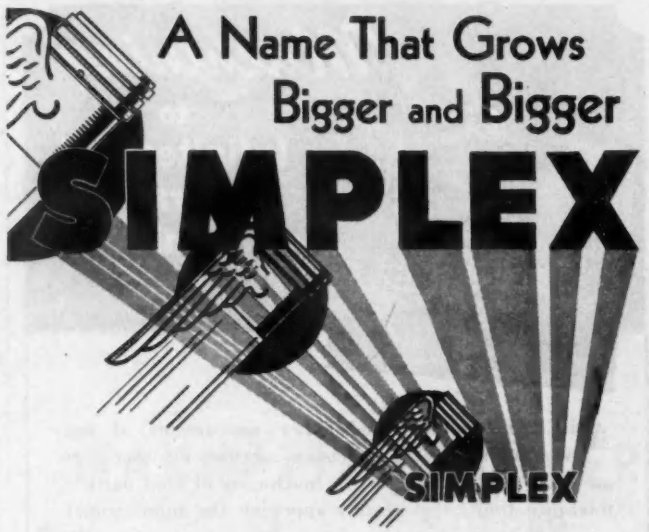
TRADE MARK



Simplification of ring design—the combining into a single ring all the desirable features of many individual rings has accounted for the great growth in popularity of the Simplex Piston Ring.

In a single Simplex Ring design may be obtained complete oil and compression control; accurately measured cylinder lubrication; automatic, effortless break-in; non-scuffing; fuel economy and long wear.

No other basic ring design provides so many desirable features in a single ring as does the Simplex laminated piston ring.

Through this revolutionary ring construction principle Simplex has greatly simplified the reconditioning problem for you. Take advantage of it and save both time and money. Specify rings "Made by Simplex."

"FLYING PISTON"

SIMPLEX RINGS

SIMPLEX PRODUCTS CORP., 3820 Kelley Ave., Cleveland, O.

GRAND QUICK LOCKCET
With Trigger Release

The best time-saving clamp for light, fast production work. Can be applied or released in a jiffy. Will pay for itself in a few days. Swinging, locking lever, gib seat makes it absolutely non-creeping on any parallel, slanting or rounded surface. Spring tension holds to desired opening. Trigger release action frees screw instantly with a single motion for re-setting or permits re-clamping to other work of same thickness without any further screw adjustment. Screw, swivel and trigger release action are COPPER PLATED. Made of heat-treated spring steel. Proof test approx. 2500 lbs.

Two models, one for Aluminum and Soft Metals

Ask about our Complete Line of GRAND Speed Clamps for every kind of work.

Catalog Free on Request.

GRAND SPECIALTIES CO.
3113 West Grand Ave. Chicago 22, Ill.

After The Others Failed

SpeedWay's "know how" was able to develop new gearmotor designs for the Armed Forces that did the required job. Today, expanded needs for these motors take SpeedWay's capacity, as well as the capacities of other large motor manufacturers, *working to SpeedWay Specifications.*

If you need motors or gearmotors for a standard or special application, bring your problem to SpeedWay Motor outputs range from 1/3000 to 1/3 h.p. Unlimited gear ratios available from stock gears. Write for our recommendations on your war or postwar problem.

Write for SpeedWay's new Motor Bulletin showing standard A.C., D.C., and Universal Motors and gearmotors.

SPEEDWAY MFG. CO. 1872 S. 52nd Ave., Cicero 50, Ill.

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Advertisers

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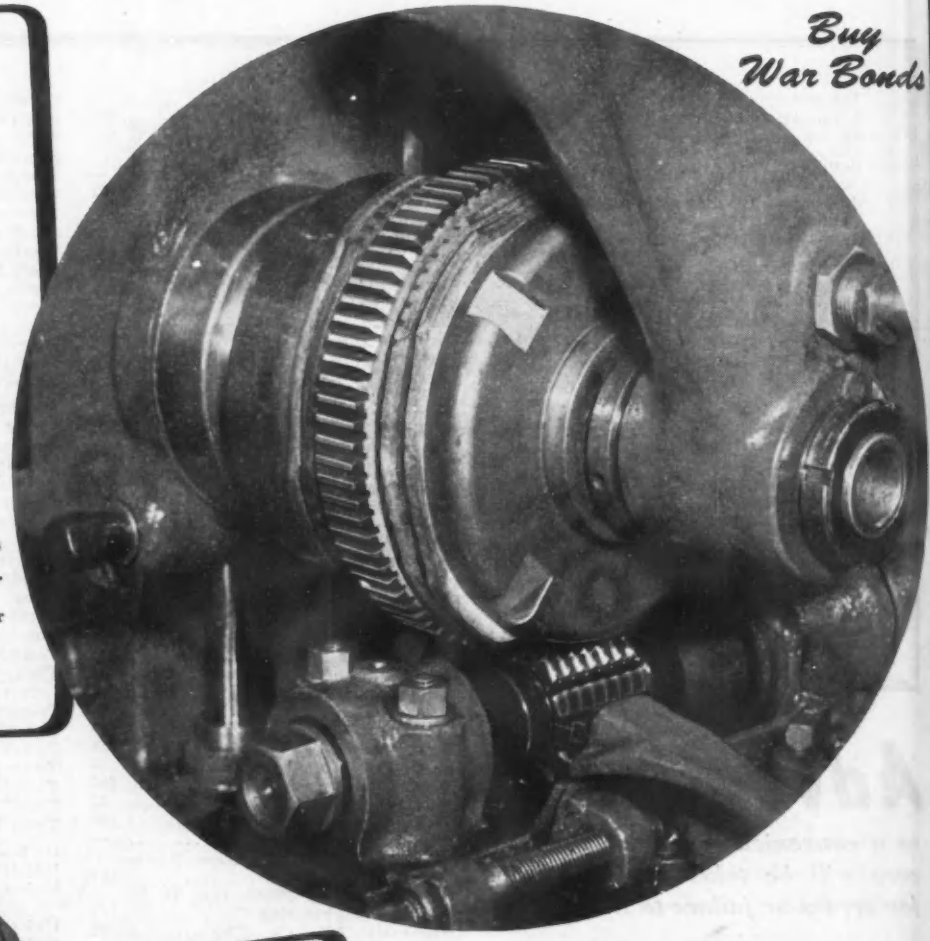
Buy War Bonds

JOB DATA

PART: Valve Timing Gear for Aircraft Engine. MATERIAL: AMS 6240 steel, Brinell-197-170, soft but tough. PIECE: 9" O.D. - 5/8" face, 80 teeth, 20° P.A., 9-11 pitch, spur form. SET-UP: .080" feed per rev. of work, 82 r.p.m. hob speed. PRODUCTION TIME: 25 minutes per load of 2. CUT: Semi-finishing, to leave .012" stock. HOB: 2 3/8" x 2 3/8" x 1 1/4" straight hole, single thread, ground, non-topping.

HOB LIFE:—3 Settings—20 pieces per setting—60 pieces per grind.

ACCURACY—measurement over .1875" dia pins held to $\frac{9.150"}{9.160"}$



ANOTHER EXAMPLE OF

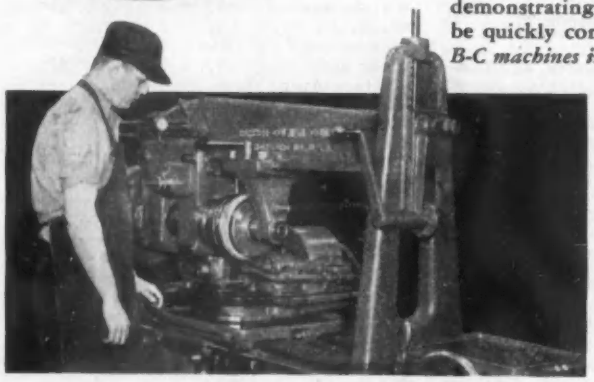
BARBER-COLMAN

HOBBING MACHINE PERFORMANCE

CLIMB HOBBING

OF AIRCRAFT ENGINE TIMING GEARS

Here is a good example of efficient production on a large gear of tough material. Two blanks are held together on an air-operated clamping arbor. CLIMB HOBBING is used for better finish because it minimizes the tearing effect usually encountered in such tough material. Barber-Colman Hobbing Machines . . . now demonstrating their accuracy and durability in hundreds of busy war plants . . . will be quickly convertible to peace-time production when the time comes. *Keep your B-C machines in good condition, and they will serve you well for many years.*



TYPE "A" HOBBING MACHINE

The size and type of hobbing machine illustrated here is only one of a wide variety of machines we make for cutting the teeth on spur and helical gears, splined shafts, and other hobbed forms from tiny watch pinions up to heavy tractor drive gears. The Type "A" is a medium-size machine with high accuracy and high production efficiency. For full details, write for Bulletin F-1099.

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HOBS, HOBBING MACHINES, HOB SHARPENING MACHINES, REAMERS, REAMER SHARPENING MACHINES, MILLING CUTTERS, SPECIAL TOOLS

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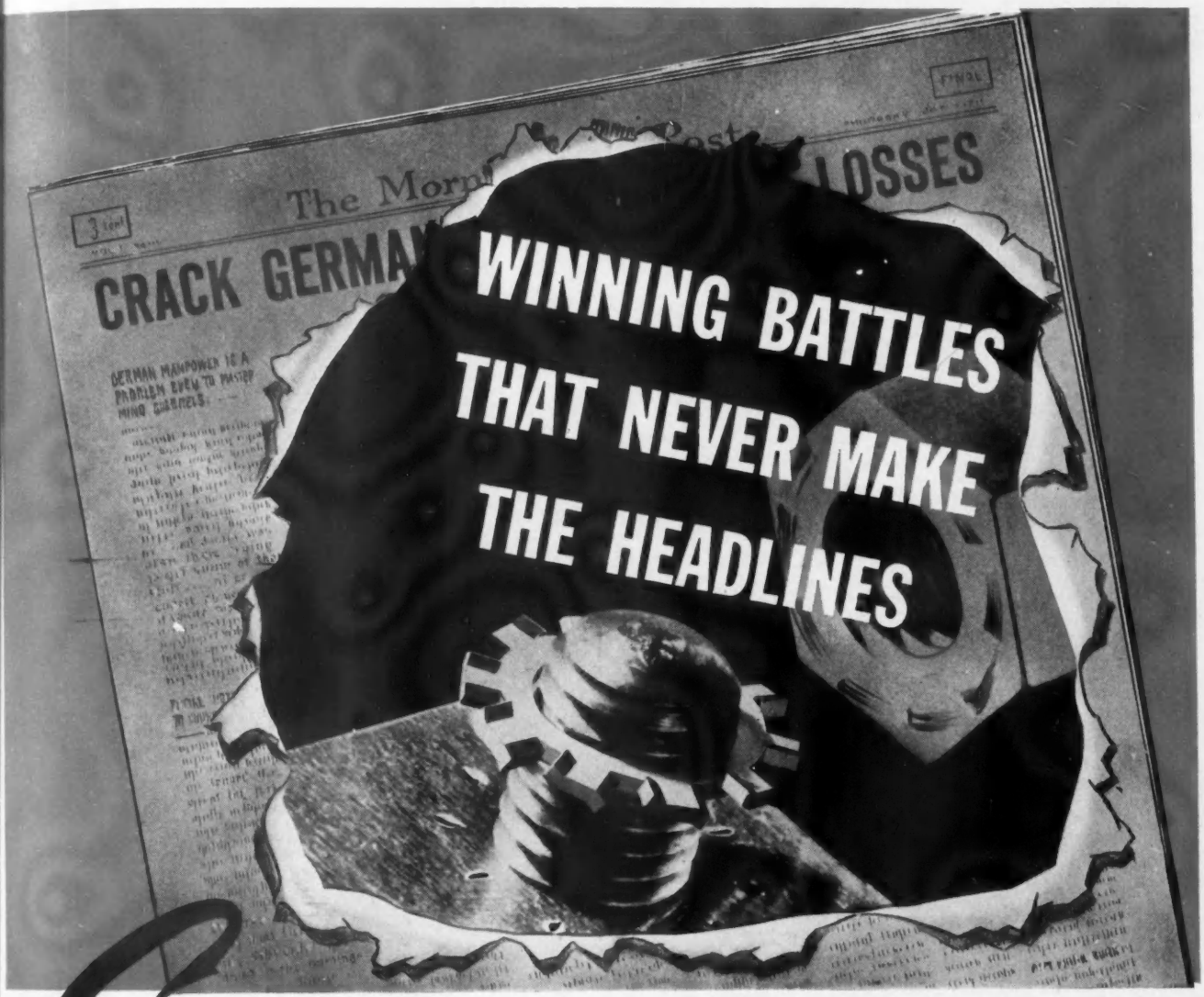
GENERAL OFFICES AND PLANT • 107 LOOMIS STREET • ROCKFORD, ILLINOIS, U. S. A.



EverLOCK WASHERS

THE WASHER THAT HAS THE EDGE

Listed on Government Ordnance Standard Prints BEAX 1-2-3-4-7-8-10
Shown on AN936 (Army-Navy Aeronautical Standard)

PROMPT DELIVERY ON MOST SIZES

On the battle fronts . . . in production equipment vital to our war effort . . . EverLOCK Washers are holding the line against vibration, strain, expansion and contraction. They don't make news, because—once they have locked vital nuts, bolts and screws into position—they never require a second thought.

Notice how the chisel edges of the EverLOCK Washer shown above has—when flexed under pressure—dug deep grooves into the nut and work. Only EverLOCKS provide this multiple locking action on many wide chisel edges.

EverLOCK Washers combine important savings in assembly time with this double indemnity against loosened bolts, nuts and screws.

Wire, phone or mail your orders today.

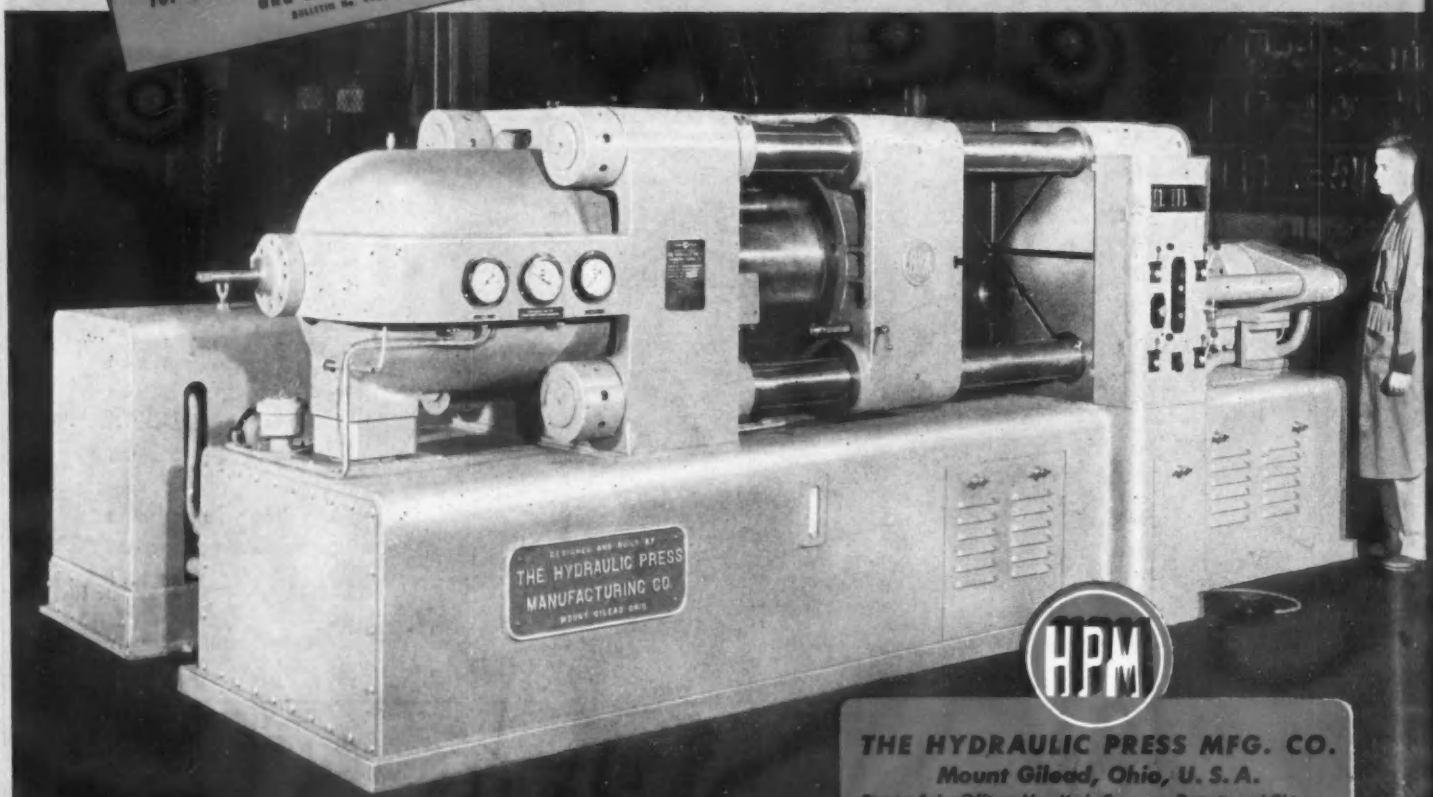
THOMPSON-BREMER & CO., 1642 W. HUBBARD ST., CHICAGO 22, ILL.

DIE CASTING MACHINES...the latest addition to the H·P·M line of "All-Hydraulic" Metal Working Presses

H-P-M's 67 years of experience in designing and building hydraulic presses is represented in this new line of high pressure metal die casting machines. Self-contained units, with "all-hydraulic" operation, these new H-P-M die casting machines will answer the ever increasing need for large capacity, high pressure machines for casting aluminum, magnesium and copper alloys.

H-P-M die casting machines are of revolutionary design in that mold clamping, metal injecting, core pulling and ejecting units are all operated by direct hydraulic means. Simplicity of operation and control are outstanding.

H-P-M die casting machines are powered by the reliable H-P-M oil-hydraulic operating system. Each pump, valve and control is designed and built by H-P-M, especially for heavy duty service. Write today for H-P-M Bulletin 4402 describing these new H-P-M die casting machines.



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